1. PURPOSE AND NEED

1.1 Introduction

Private Fuel Storage L.L.C. (PFS), a limited liability company owned by eight U.S. electric power generating companies, proposes to construct and operate a privately-owned independent spent fuel storage installation (ISFSI) on the Reservation of the Skull Valley Band of Goshute Indians (Reservation) (see Figure 1.1). The Reservation is bordered on all sides by Tooele County, Utah. To transport spent nuclear fuel (SNF) to the ISFSI, PFS proposes to construct and operate a rail siding and rail line on land managed by the U.S. Department of Interior’s Bureau of Land Management (BLM). The project, as proposed, requires approval from four Federal agencies: the U.S. Nuclear Regulatory Commission (NRC), the U.S. Department of Interior's Bureau of Indian Affairs (BIA) and BLM, and the U.S. Surface Transportation Board (STB). The NRC, BIA, BLM, and STB (the Cooperating Federal Agencies) have cooperated in the preparation of this final environmental impact statement (FEIS).

This FEIS evaluates the potential environmental effects of the ISFSI proposed by PFS, including the construction and operation of new transportation facilities that would provide access to the proposed ISFSI, and a consideration of alternatives to that proposal. This FEIS has been prepared in compliance with the National Environmental Policy Act of 1969 (NEPA), NRC regulations for implementing NEPA (10 CFR Part 51), and the guidance provided by the Council on Environmental Quality (CEQ) regulations implementing the procedural provisions of NEPA (40 CFR Part 1500).

1.2 The Proposed Action

The proposed action would include construction and operation of the proposed ISFSI [also called the Private Fuel Storage Facility (PFSF)], including transporting SNF to the proposed PFSF, and the construction of a rail line from Skunk Ridge to the proposed PFSF site (see Figure 1.2 for project locations).

The proposed PFSF would be constructed and operated on the Reservation at a location 93 km (58 miles) straight-line distance southwest of Utah’s State Capitol Building [or about 120 km (75 miles) by road] and approximately 44 km (27 miles) west-southwest of Tooele, Utah (see Figure 1.1). PFS proposes to build the ISFSI on a 330-ha (820-acre) site leased from the Skull Valley Band of Goshute Indians (Skull Valley Band). The site (designated Site A) would be located in the northwest corner of the Reservation approximately 6 km (3.5 miles) from the Skull Valley Band's village.

The proposed PFSF would be designed to store up to 40,000 metric tons of uranium (MTU) (44,000 tons) of SNF. The capacity of the proposed PFSF would be sufficient to store all the SNF from the PFS member companies, as well as some SNF from nuclear power reactor licensees that are not members of PFS. The eight members of PFS are Entergy Corporation, Southern California Edison Company, Genoa FuelTech, Inc., Indiana-Michigan Company (American Electric Power), Florida Power and Light Company, GPU Nuclear Corporation (which does not plan to use the proposed PFSF for storage), Xcel Energy Inc., and Southern Nuclear Operating Company. (Previous members of PFS listed in the DEIS, but not listed above, have been renamed, acquired by, or merged with other companies.) The locations of their reactors are shown in Figure 1.3.

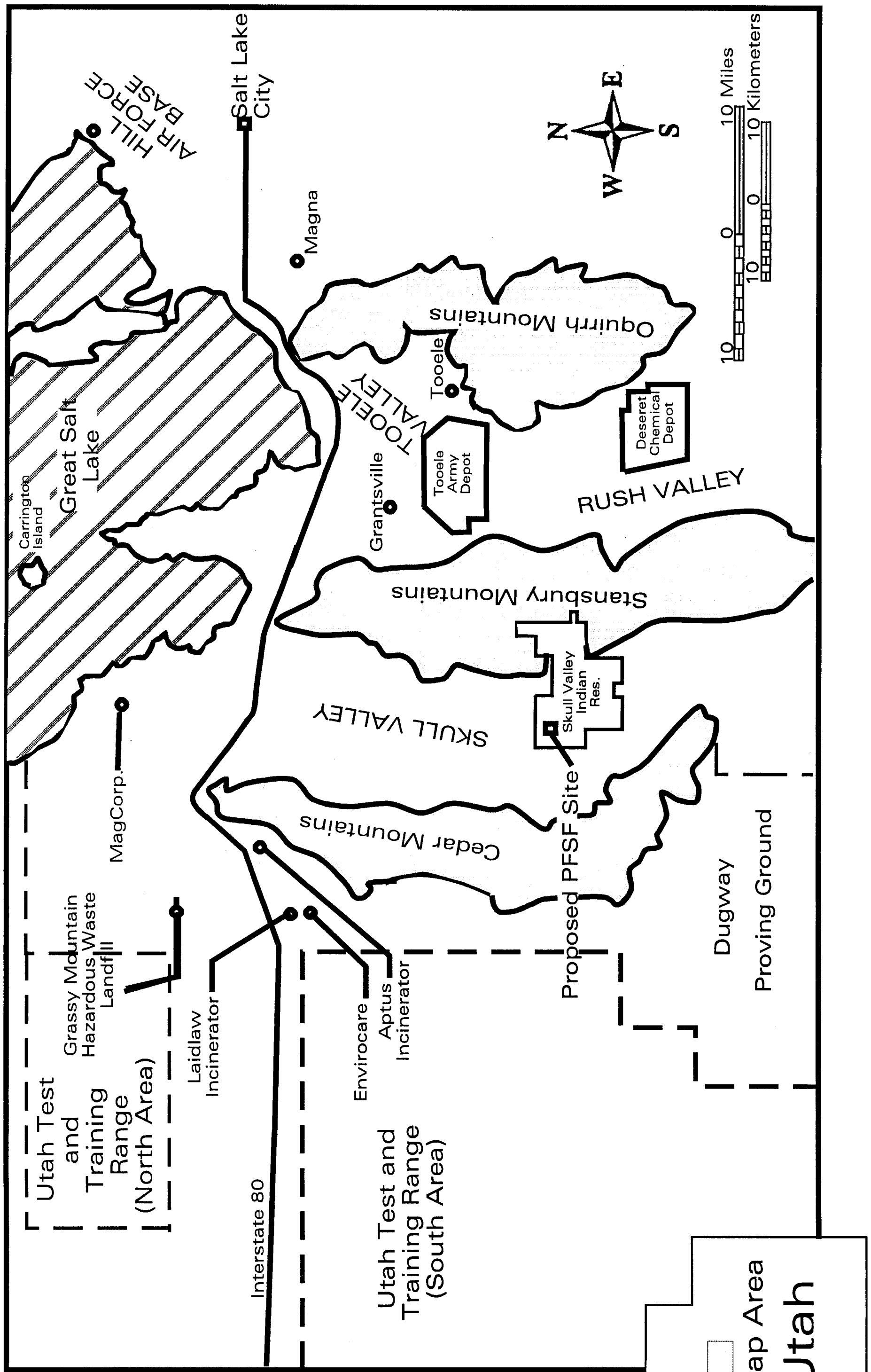

Figure 1.1. Regional location of Skull Valley in Utah.

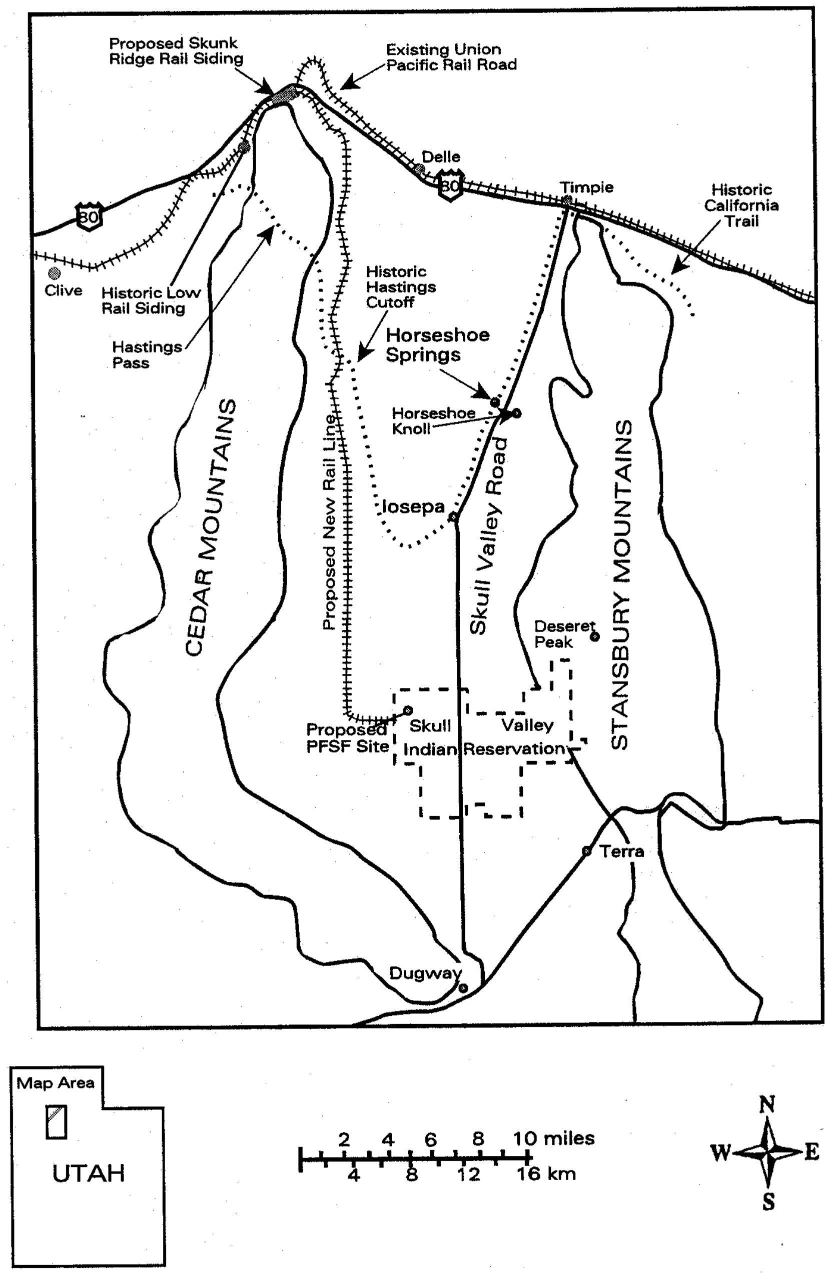

Figure 1.2. The proposed project area in Skull Valley, Utah.

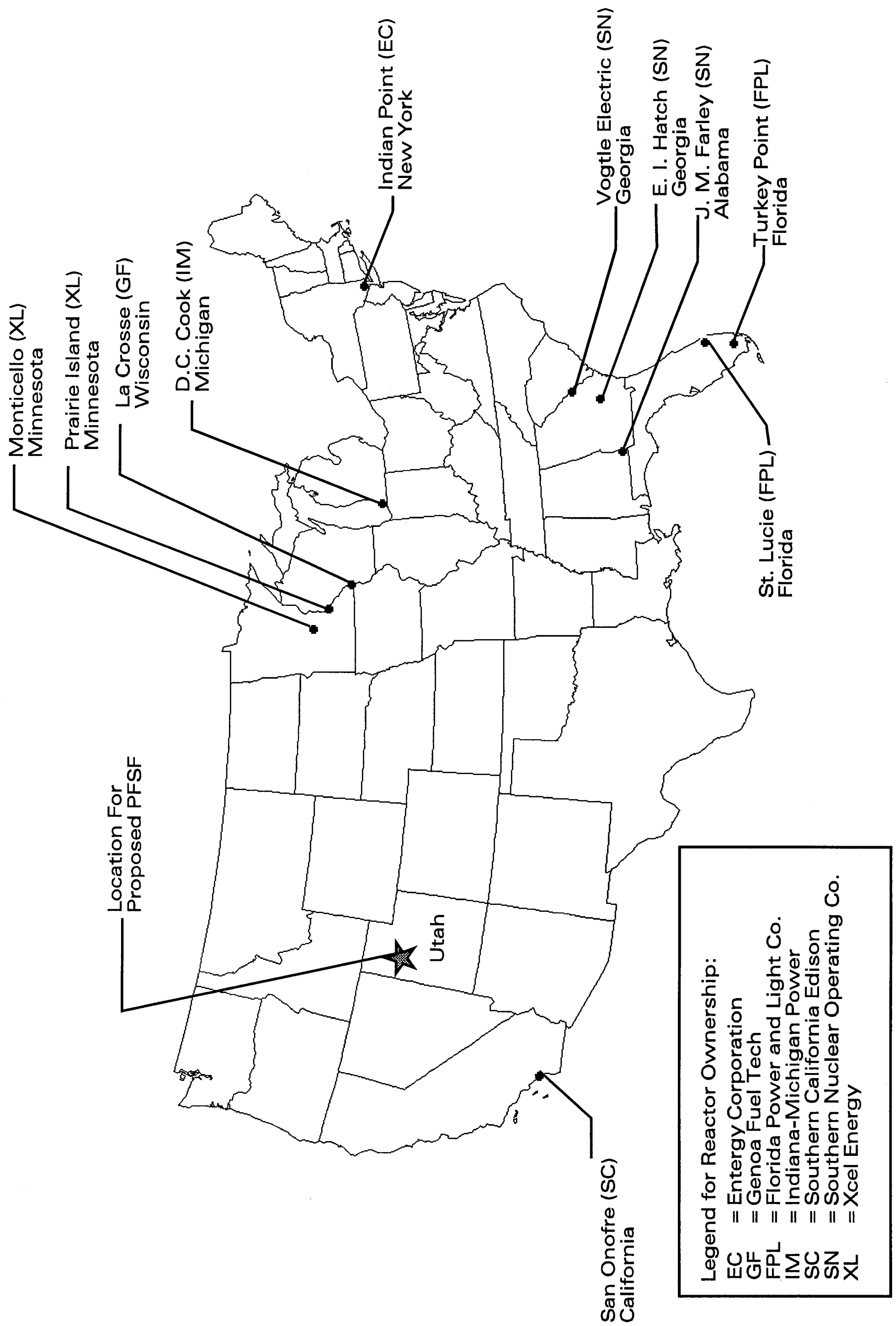

Figure 1.3. Reactors which are owned by the PFS companies.

BACKGROUND INFORMATION ON SPENT NUCLEAR FUEL

More than 100 commercial nuclear power plants have been built in the U.S. and about 20 percent of the nation's electricity comes from nuclear power. Like other industrial plants, nuclear power stations produce byproducts from their operating processes. The primary by-product from a nuclear reactor is used or "spent" nuclear fuel (SNF).

Nuclear fuel consists of enriched uranium in small, ceramic-like pellets, slightly larger than pencil erasers. These small pellets produce a tremendous amount of energy when used in a nuclear power plant. For example, a single pellet contains the energy equivalent of almost one ton of coal. The pellets are stacked end-to-end and sealed inside metal tubes 3.5 to 4.5 m (12 to 15 ft) long. The tubes containing the uranium pellets are bundled together in groups of about 200 to form nuclear fuel assemblies (DOE 1999). These fuel assemblies are placed inside a nuclear reactor and function as the core where the nuclear fission process occurs. Fission is a controlled chain reaction, in which atoms split, thereby releasing energy and producing heat. The heat is then used to generate steam and to produce electricity until the fuel becomes “spent,” or no longer efficient in generating the amounts of heat needed.

Periodically about one-third of a nuclear reactor's fuel is removed and replaced with new, more efficient fuel (this is called an operating cycle and typically lasts 18–24 months). Thus a reactor may operate for 2–3 operating cycles after it loses full-core offload capability. Full core offload capability refers to a power plant’s capability to remove all fuel from the reactor vessel and store it in the spent fuel pool. Radioactive materials remain inside the sealed tubes within the fuel assemblies after the assemblies have been removed from the core.

During the term of the operating license, the SNF assemblies are typically first stored under water in pools after removal from the reactor core. The water in these pools is circulated to maintain cooling and is monitored for radioactivity and for evidence of tube corrosion. Over time, the fuel assemblies lose heat and also become less radioactive. Fuel assemblies may also be stored in dry storage facilities, typically after being in the pool for five years or more.

PFS proposes to use a dual-purpose canister-based system for storage and transportation of the SNF. At the reactor sites of commercial nuclear power plants, the SNF assemblies to be shipped to the proposed PFSF would be placed in sealed metal canisters. These canisters would then be placed inside NRC-approved steel shipping casks for transport by rail to a new rail siding north of the proposed PFSF. The proposed action would allow for local transportation to the proposed PFSF site from the new rail siding via a proposed new rail line (see Figure 1.2). The number of loaded spent fuel canisters (inside shipping casks) to be received at the proposed PFSF is estimated to be between 100 and 200 annually. Each canister would contain approximately 10 MTU of SNF.

At the proposed PFSF site, dry cask storage technology would be used. The sealed metal canisters containing SNF would be loaded into steel/concrete storage casks that are then placed on concrete pads for storage. Canister-based cask systems confine radioactive wastes and would be licensed by the NRC in accordance with 10 CFR Part 72 (NRC requirements for storage of SNF). As many as 4,000 canisters in individual storage casks could be needed to store a maximum of 40,000 MTU of SNF. Phase 1 construction, which would provide an operational facility, would begin upon issuance of the NRC license and effectiveness of the BIA lease and would be completed within 18 months. Ownership and ultimate responsibility for the SNF would continue to remain with the originating utilities, until such time as responsibility for the SNF is transferred to the U.S. Department of Energy (DOE) for long-term storage or disposal. A more detailed description of the proposed project facilities and the proposed storage system is provided in Section 2.1 of this FEIS.

The maximum amount of SNF that the applicant could accept at the proposed PFSF over the term of the license is 40,000 MTU (44,000 tons). Once the applicant has accepted 40,000 MTU of SNF, it may not accept any additional SNF shipments, even if it has begun to ship SNF off site. The NRC license would not allow the applicant to accept more than 40,000 MTU of SNF over the life of the license, unless PFS requests a license amendment to increase the maximum storage capacity and the request is granted (after notice to the public and opportunity for a hearing).

The proposed PFSF would be licensed by the NRC to operate for up to 20 years. The applicant has indicated that it may seek to renew the license for an additional 20 years (total of 40 years). By the end of the licensed life of the proposed PFSF and prior to the expiration of the lease, it is expected that the SNF would have been shipped to a permanent repository. This is consistent with the NRC's Waste Confidence Decision (55 Fed. Reg. 38474; Sept. 18, 1990), which states that at least one mined geological repository will be available by the end of 2025. On December 6, 1999, the NRC issued a *Federal Register* Notice (64 Fed. Reg. 68005) which presented a status report on the Waste Confidence Decision. The status report stated that "[t]he Commission is of the view that experience and developments since 1990 confirm the Commission's 1990 Waste Confidence findings." Service agreements (i.e., contracts) between PFS and companies storing SNF at the proposed PFSF will require that the contracting companies remove all SNF from the proposed PFSF by the time the PFS license is terminated and PFS has completed its licensing or regulatory obligations under the NRC license. The service agreement requirement to remove the SNF from the proposed PFSF is not dependent upon the availability of a permanent geological repository. Therefore, if the PFS license is terminated prior to the availability of a permanent geological repository, the companies storing SNF at PFSF would continue to retain responsibility for the fuel and must remove it from the proposed PFSF site prior to termination of the PFS license.

1.3 Need for the Proposed Action

The proposed action is intended to satisfy the need for an interim facility that would provide a safe, efficient, and economical alternative to continued SNF storage at reactor sites. Such an interim facility would satisfy a need for additional storage capacity of the PFS members, as well as non-member nuclear power reactor licensees who face storage limitations, and ensure that (1) operation of a nuclear power plant would not cease before operating license expiration because of a lack of SNF storage capacity; (2) permanently shut-down reactors could be decommissioned sooner, resulting in a savings to the reactor licensees and earlier use of the land for other activities; and (3) for some reactor licensees, an economical alternative to at-reactor storage would be available. In addition, the proposed action would serve the Skull Valley Band's economic development, consistent with the BIA's trust responsibility.

Storage of SNF at commercial nuclear reactor sites is an increasingly important concern to the companies operating these facilities. As set forth below, many reactor licensees are faced with the possibility that their facilities will be unable to store sufficient SNF and be forced to halt power generation operations before their operating licenses expire.

The on-site SNF storage capacities (i.e., of spent fuel pools) of many U.S. nuclear power plants were designed to accommodate only a few reactor core discharges. The rationale was that SNF would be periodically removed from the spent fuel pool and shipped offsite for reprocessing[1] before the pool became full. However, production-scale reprocessing of SNF never materialized[2] to the extent anticipated because of the relative abundance of natural uranium and the U.S.'s concern that the use of plutonium from reprocessed civilian SNF could be used for nuclear weapons production (i.e., the non-proliferation issue) (Holt 1998). Because, the U.S. has abandoned the concept of reprocessing SNF, the "once through" nuclear fuel cycle without reprocessing is the current practice.

In 1977, DOE announced that the Federal Government would accept and take title to the SNF from U.S. commercial power reactors. This policy was designed to meet the needs of nuclear reactor licensees for both interim and permanent disposition of SNF (NRC 1979). DOE was mandated by the Nuclear Waste Policy Act of 1982 (NWPA) to begin disposing of commercial SNF at a permanent underground repository by January 31, 1998. To fund the program, nuclear power generating companies were required to pay a fee, proportional to the amount of power (in kilowatt-hours) they generated, into the nuclear waste fund (Holt 1998).

Both the original NWPA and the Nuclear Waste Policy Act Amendment of 1987 (NWPAA) included provisions for centralized interim storage as a component of the national program. The original Act called for DOE to provide long term interim storage until a permanent repository became available. The long term interim storage facility, a monitored retrievable storage facility (MRS), was to be located in any state other than the state in which the permanent geological repository would be located. The NWPAA created the position of Nuclear Waste Negotiator (NWN), who was assigned the task of finding a host site for a MRS. Several Federally Recognized Indian Tribes (including, for example, the Skull Valley Band) and other units of government expressed interest in hosting the MRS. However, the MRS program expired in 1994 without an MRS host being identified.

A permanent geological repository is now projected to be completed by DOE and could begin receiving commercial reactor SNF by 2010 (DOE 1999). Before a permanent repository becomes available, however, several nuclear power generating companies anticipate that their on-site SNF pool storage capacity may become inadequate. As a result, these companies see an interim facility as a viable solution to their SNF storage concerns.

To date, nuclear power reactor licensees have been coping with the SNF storage problem primarily by employing two methods to increase on-site SNF storage capacity: (1) expanding the capacity of spent fuel pools to store SNF and (2) constructing ISFSIs at the reactor site (also called "at-reactor" ISFSIs). Spent fuel pool storage capacity may be expanded by adding new fuel storage racks or by replacing the existing racks with new ones designed for closer spacing of fuel assemblies, thus allowing more fuel assemblies to be stored in the pool. Although many U.S. nuclear power plants, including most of the plants owned by the PFS member utilities, have already expanded the capacity of their spent fuel pools to store SNF, several are still running out of storage space. In fact, many reactor fuel pools are already at capacity, and it is projected that 80 percent of U.S. reactors will lose full core offload

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[1]Reprocessing is a chemical operation in which residual uranium and plutonium in SNF are separated from radioactive wastes (fission products) produced during reactor operation. The residual uranium and plutonium are then purified and reused.

[2]The reprocessing of commercial nuclear fuel did occur at a facility in West Valley, New York, from 1966 to 1972.

capability by 2010 (see Figure 1.4). Full core offload capability refers to a power plant's capability to remove all fuel from the reactor vessel and store it in the spent fuel pool. Table 1.1 lists the remaining storage capacity for each plant owned by PFS members and the projected date when full core offload capability would be lost.

PFS estimates the total SNF to be shipped to the proposed PFSF under anticipated service contracts is greater than 15,500 MTU. PFS states that a 40,000 MTU facility would make additional SNF storage capacity available for SNF from other nuclear power plants that are projected to require additional storage capacity while operating and for acceptance of SNF from shutdown nuclear power plants.

Regulations have been established by NRC in 10 CFR Part 72 that allow for both at-reactor ISFSIs and off-site ISFSIs (also called "away-from-reactor" ISFSIs). Pursuant to Subtitle B of the NWPA, all licensees of nuclear power plants licensed under 10 CFR Part 50 have a general license for at-reactor dry cask storage at an on-site ISFSI. A nuclear power generating company exercising its general license may select a storage cask system approved by NRC and listed in 10 CFR Part 72, Subpart K. A reactor licensee must maintain its Part 50 license in order to maintain its general license for dry cask storage.

Nuclear power generating companies may also apply for a site-specific ISFSI license under 10 CFR Part 72. An application for a site-specific license must specify the storage cask(s) that the utility plans to use. A site-specific license can be for at-reactor or away-from reactor storage. Companies storing spent fuel under site-specific licenses are not necessarily required to maintain Part 50 licenses to do so.

As of October 2001, there were 20 ISFSIs operating in the United States (see Figure 1.5), and approximately 20 additional ISFSIs are either proposed or being considered for the near term. Of the 20 operating ISFSIs, two (Prairie Island, Hatch) are owned by PFS members. All operating ISFSIs in Figure 1.5 are located at licensed reactor sites except GE-Morris and the DOE facilities at Fort St. Vrain and the Idaho National Engineering and Environmental Laboratory.

While many reactor licensees are building at-reactor ISFSIs, PFS has identified three primary reasons why an away-from-reactor ISFSI is needed. First, PFS indicated that political or physical constraints at some reactor sites could prevent expanding on site storage. At least one PFS member has physical site limitations that would prevent building or expanding an at-reactor ISFSI. For this reactor, an away-from-reactor ISFSI would provide an SNF storage option. Absent such an option, this reactor would have to shut down once it reaches its SNF storage capacity, which might occur prior to the end of its current operating license. PFS also stated that some reactor sites are subject to state legislation or local restrictions or processes that could restrict or prohibit storage expansions. In addition, PFS states that state legislation or state regulatory decisions have imposed very costly and burdensome restrictions or limitations on storage expansions, raising the risk that future expansions may be restricted, delayed, limited, or prohibited; for example, the State of Minnesota has imposed restrictions on further expansion of SNF storage capability at the Prairie Island reactor site. PFS has stated that other facilities that have not added dry storage and have exhausted in-pool storage expansion alternatives may experience either political or physical site constraints in the future that could prohibit dry storage and thus require shutdown of the nuclear power plant.

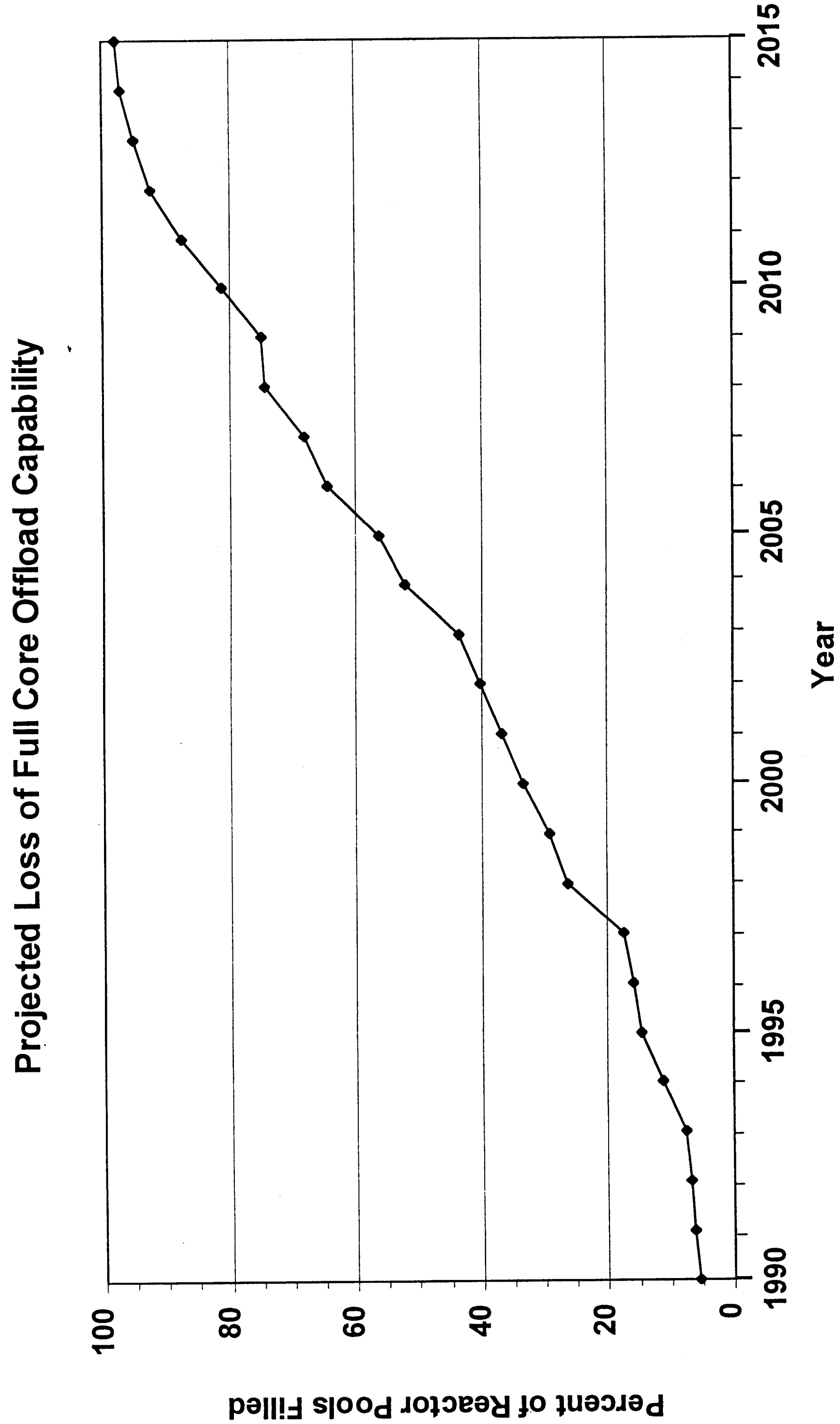

Figure 1.4. Projected loss of full core offload capability for U.S. commercial nuclear reactors. *Sources:* Energy Resources International and DOE/RW-0431, Rev. 1.

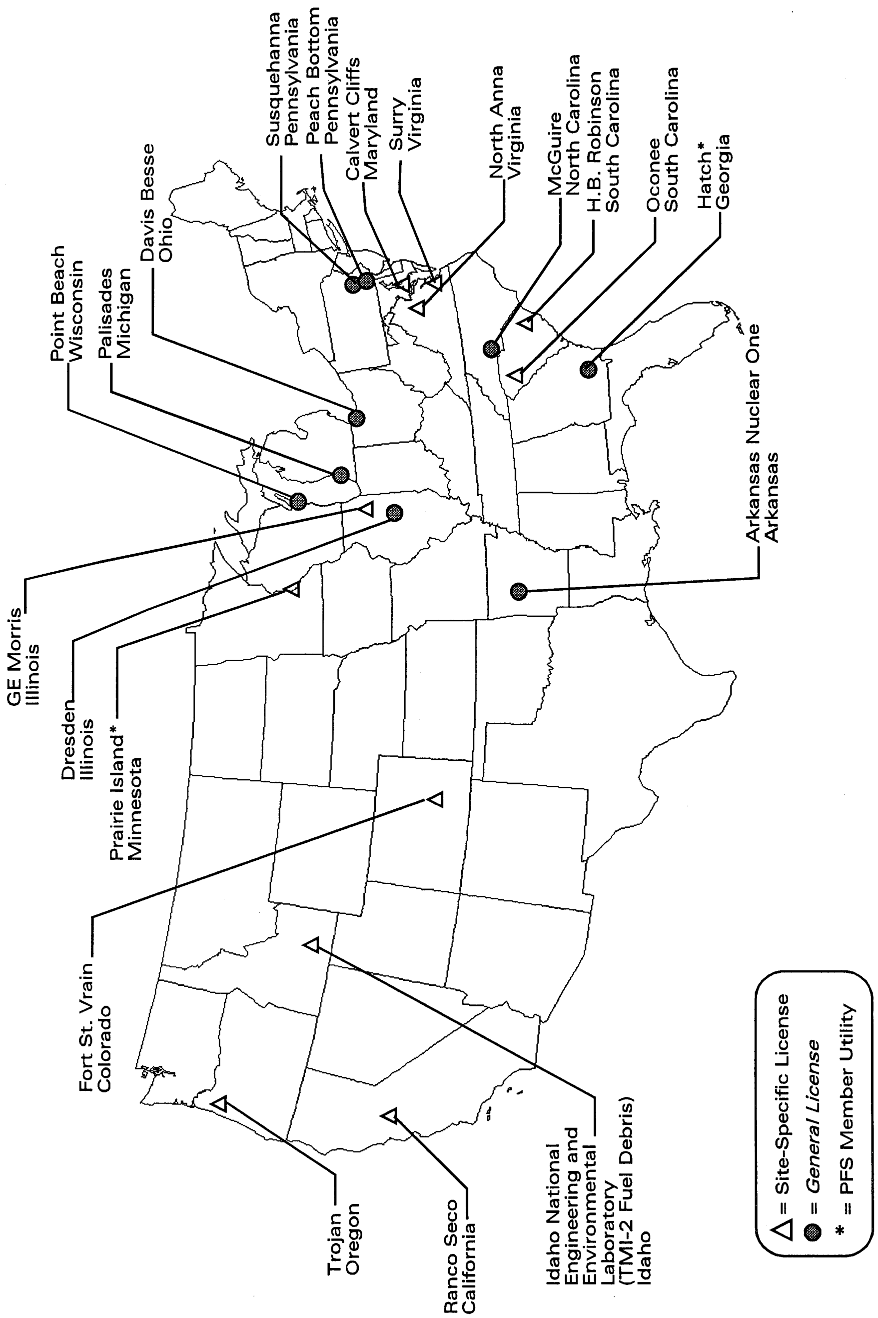

Figure 1.5. Operating spent fuel storage sites (i.e., ISFSIs) as of October 2001.

Table 1.1. Site-specific reactor information for PFS member utilities

Utility	Reactor[a]	Remaining storage capacity (no. spaces)	Projected date of loss of full-core offload capability
Entergy Corporation	Indian Point Unit 1	Shutdown; fuel onsite	N/A (shutdown)
	Indian Point Unit 2	385	2004
Southern California Edison Co.	San Onofre Unit 1	Shutdown; fuel onsite[b]	N/A (shutdown)
	San Onofre Unit 2	480	2006
	San Onofre Unit 3	524	2006
Genoa FuelTech, Inc.	La Crosse Boiling Water Reactor	Shutdown; fuel onsite	N/A (shutdown)
Indiana-Michigan Company (American Electric Power)	D.C. Cook Units 1 and 2	1,553 (shared)	2010 (both units)
Florida Power and Light Co.	St. Lucie Unit 1	483	2005
	St. Lucie Unit 2	528	2007
	Turkey Point Unit 3	520	2010
	Turkey Point Unit 4	501	2011
GPU Nuclear Corporation (not planning on using proposed PFSF for storage)	None	N/A	N/A
Xcel Energy, Inc.	Monticello	971	2006
	Prairie Island Units 1 and 2	140 (shared)	2007 (both units)
Southern Nuclear Operating Co.	Farley Unit 1	376	2006
	Farley Unit 2	560	2008
	Hatch Units 1 and 2	859 (shared)	*N/A*[c]
	Vogtle Units 1 and 2	2,066 (shared)	2014 (both units)

[a]See Figure 1.3 for reactor locations.

[b]Pool is full; additional Unit 1 assemblies are being stored on an interim basis in Units 2 and 3 pools and in space leased at the General Electric Morris Facility through 2002.

[c]Southern Nuclear Operating Co. has obtained a license for an ISFSI to store spent fuel from Hatch Units 1 and 2, and has transferred some spent fuel from the Hatch reactors' fuel pool out to the dry storage facility where the fuel is stored in storage casks. As a result of this on-site dry storage capability, full-core offload capability is planned to be maintained at all times for Hatch Units 1 and 2, so there is no projected date for loss of full-core offload capability.

Source: PFS/ER 2001; information and data are current as of November 2000.

Second, an away-from-reactor ISFSI could afford nuclear power generating companies with reactors that are already shutdown the ability to fully decommission their sites sooner. PFS indicated that some of its members currently hold licenses for reactors that are already shutdown and that the licenses for 20 of the PFS members' units will expire before the DOE permanent geological repository can accept all the accumulated fuel from the individual sites. An away-from-reactor ISFSI would provide an off-site facility for the storage of SNF, thereby potentially reducing the amount of time a reactor licensee would need to maintain a shut down reactor site. Until all SNF has been removed, the site cannot be fully decommissioned, and a reactor owner would continue to incur the cost of maintaining the reactor site.

Third, PFS has indicated that a centralized away-from-reactor ISFSI would reduce the cost of SNF storage. Due to economies of scale, spent fuel storage at a centralized storage facility is projected to be more cost effective than long-term storage of SNF at nuclear power plant sites until a DOE permanent geological repository is available. PFS indicated that its members decided to proceed with the project based on these financial projections, since the proposed PFSF would provide a lower cost SNF storage alternative than other options that are available. Although additional nuclear power generating companies have not joined PFS to date, PFS maintains that additional companies would likely utilize the proposed PFSF instead of building additional at-reactor storage capacity or continuing to store SNF at shutdown nuclear power plant sites because it would be a cost effective alternative.

1.4 Scoping Process

1.4.1 Scoping for the Draft EIS

The scoping process was initiated on May 1, 1998, with the publication of a Notice of Intent (NOI) to prepare an EIS and conduct the scoping process (63 Fed. Reg. 24197). As described in the NOI, the objectives of the scoping process were to

- define the scope of the proposed action that is to be the subject of the EIS;
- determine the scope of the EIS and identify significant issues to be analyzed in depth;
- identify and eliminate from detailed study issues that are peripheral or are not significant;
- identify any environmental assessments and other EISs that are being or will be prepared that are related to but are not part of the scope of the EIS under consideration;
- identify other environmental review and consultation requirements related to the proposed action;
- indicate the relationship between the timing of the environmental analyses and the Commission's tentative planning and decision-making schedule;
- identify any Cooperating Agencies and, as appropriate, allocate assignments for preparation and schedules for completion of the EIS to the NRC and any Cooperating Agencies; and
- describe the means by which the EIS will be prepared, including any contractor assistance to be used.

A scoping meeting was held in Salt Lake City, Utah, on June 2, 1998. Thirty-five people offered comments at the meeting, including the Governor of Utah (via videotape), a member of the U.S. Congress, representatives from Federal and State of Utah agencies, and Federally Recognized Indian Tribes. During the scoping meeting, PFS presented a briefing on the proposed action and the NRC staff summarized the environmental review process and the proposed scope of the EIS. Comments and suggestions from the audience were received and are summarized in the scoping report (NRC

1998) (see Appendix A). During the remainder of the scoping period, NRC received 30 comment letters, which are also summarized in the scoping report.

Two additional scoping meetings were held on April 29, 1999, to address the PFS proposal to construct a new rail line down the western side of Skull Valley and the required plan amendment to the Pony Express Resource Management Plan (RMP), and to address any environmental concerns associated with the lease agreement that might not have been discussed at the previous scoping meeting. The notice for these meetings was published in the *Federal Register* on April 14, 1999, (64 Fed. Reg. 18451). One meeting was held in Salt Lake City and the other in Tooele, Utah. After presentations were made by BIA, BLM, and the NRC, oral comments were provided by representatives of a member of the U.S. Congress, Utah State departments or agencies, a Federally Recognized Indian Tribe, private organizations, and interested members of the public. Written comments were also received (see Appendix A).

The comments provided by the State of Utah and other interested members of the public, which represent the major points of view on the proposed action, identified a number of environmental concerns. These concerns were summarized in the original scoping report and the supplemental scoping report and were considered in determining the scope of this EIS (see Appendix A).

On the basis of the scoping process and the requirements of NEPA and 10 CFR Part 51, the Cooperating Federal Agencies determined that this EIS would address the potential environmental impacts of constructing and operating the proposed PFSF and related transportation facilities for the following issues:

- ***Radiological impacts and human health and safety.*** The potential public health consequences of the proposed action are evaluated with emphasis on radiological exposure risk during normal operations, including transport of the SNF (including handling, transfer, and inspection activities) and under credible accident scenarios. Nonradiological events and activities with potential human health impacts are also identified and evaluated.
- ***Cumulative impacts.*** The FEIS analyzes the potential cumulative impacts, if any, of the proposed PFSF in the context of other existing and proposed facilities and activities in the area of the proposed project area, which includes the site, the rail line, and the intermodal transfer facility (ITF; as described in Section 2.2.4.2), as appropriate.
- ***Socioeconomics.*** The socioeconomic issues that fall within the scope of the FEIS include the direct and indirect economic effects (both beneficial and adverse) on employment, taxes, residential and commercial development, agriculture, and public services in the area. The effects of the proposed action on land use in the area, including use of public lands, tribal trust lands, and rights-of-way, are assessed in the FEIS. The FEIS also includes an evaluation of the extent to which lands and land use may be disturbed or altered during construction and operation of all portions of the proposed action. In addition, recreational and tourism sites, wilderness areas, and aesthetic values of the area are analyzed.
- ***Cultural resources.*** The FEIS assesses potential impacts of the proposed action on the historic and archaeological resources of the area and on the cultural traditions and lifestyle of Native Americans. The FEIS also discusses the consultation process on historic properties required by the National Historic Preservation Act of 1966, as amended.
- ***Environmental Justice.*** Environmental justice issues are addressed in the FEIS as directed by Executive Order 12898. The environmental justice review includes an analysis of the human health and environmental impacts on low-income and minority populations resulting from the proposed action and its alternatives. The Cooperating Agencies used demographic data to

identify the minority and low-income groups within the area and determine if the impacts disproportionately affected these groups.

- ***Geology and seismicity.*** The FEIS describes the geologic and seismic characteristics of the proposed site and evaluates the impacts of construction and operation of the proposed action on the site's geology and soils. Evaluation of the potential for earthquakes, ground motion, soil stability concerns, surface rupturing, and any other major geologic or seismic considerations that would affect the suitability of the proposed site as a storage location for SNF are addressed in the NRC's Safety Evaluation Report (SER), as updated, (see Section 1.5.1) rather than the FEIS; the SER also addresses cask design, particularly in the context of potential seismic events. A summary of the NRC's evaluation findings is provided in this Final EIS.
- ***Transportation.*** The analysis of potential impacts resulting from the transportation of SNF considers relevant aspects of both rail and truck transport to the proposed PFSF. The FEIS discusses the number, type, and frequency of shipments, as well as routing considerations and the quantities of SNF being shipped. The impacts of transportation are evaluated primarily in terms of radiological exposure risk during normal transportation (including handling, transfer, and inspection) and under credible accident scenarios. The non-radiological impacts of transportation are also identified and evaluated. Construction and maintenance activities required for rail or road systems are assessed, including input from BIA and BLM.
- ***Accidents.*** NRC safety regulations and guidance specify that the facility be designed to withstand various credible accidents, including natural events, without having a significant radiological release. The SER includes an evaluation and determination on (1) the adequacy of the design to withstand credible accidents, (2) the potential for a radiological release to occur as a result of any such accident, and (3) the significance of any such radiological release. The FEIS analyzes the potential environmental impacts resulting from credible accidents at the proposed facility.
- ***Compliance with applicable regulations.*** The FEIS presents a partial listing of the relevant permits and regulations that have been identified as potentially applicable to the proposed PFSF. Regulatory or legal issues covered in the FEIS include water rights, land use restrictions such as rights-of-way, and oil, gas, or mineral leases that would interfere with the availability or suitability of the proposed site.
- ***Air quality.*** Potential air quality impacts of the proposed project are evaluated in the FEIS. The evaluation includes potential impacts resulting from construction activities and operation and compares the anticipated air quality impacts, if any, with relevant standards. Appropriate modeling is performed to assist in the analysis of potential air quality impacts.
- ***Hydrology.*** The FEIS assesses the potential impacts of the proposed project on surface water and groundwater resources. The assessment considers water resources, water quality, water use, floodplains, and the probable maximum flood (PMF), which is evaluated in the NRC SER, as updated.
- ***Ecological resources.*** The FEIS assesses the potential environmental impacts of the proposed action on ecological resources, including plant and animal species and threatened or endangered species or critical habitat that may occur in the area. As appropriate, the assessment includes potential effects on wildlife migration patterns, and mitigation measures to address adverse impacts are analyzed. The FEIS also discusses the consultation process required by the Endangered Species Act of 1973, as amended.
- ***Need for the facility.*** A discussion of the need for the proposed PFSF and the expected benefits is presented in the FEIS and includes an estimate of the amounts of SNF generated by participating nuclear power plant licensees and their capabilities to store that fuel.
- ***Decommissioning.*** The FEIS includes a general discussion of the impacts associated with decommissioning of the proposed PFSF and related transportation facilities.

- ***Alternatives.*** The no-action alternative and other reasonable alternatives to the proposed action, such as alternative sites or alternative storage methods, are described and assessed in the FEIS.

In addition to the above items, issues identified by BLM for the proposed rail access corridor and discussed in this FEIS include fire, range land health, livestock management, noxious weeds, wildlife, wild horses, wetlands, historic trails, and access.

1.4.2 Comments on the Draft EIS

A Draft EIS was issued for public review and comment on June 23, 2000 (see 65 Fed. Reg. 39206). A 90-day public comment period began at that time. During the public comment period, a series of public meetings were held in the Salt Lake City area. Public meetings were held in Salt Lake City and Grantsville, Utah, on July 27 and July 28, 2000, respectively. In response to public requests, two additional public meetings were held in Salt Lake City on August 21, 2000 (see 65 Fed. Reg. 49029).

Appendix H contains the written comments received during the public comment period, and includes transcripts documenting the comments received at the aforementioned public meetings. In addition to the issues identified during the scoping process for the DEIS (see Section 1.4.1), the comments received during the public comment period identified concerns about potential impacts to military operations in Utah, accidents and risks, the seismic design of the proposed PFSF, and transportation risks and impacts. As discussed in Section 1.5.1, issues such as accidents and seismicity that are related to the safety of the facility are addressed in the NRC's Safety Evaluation Report (SER), as updated, the findings of which are summarized in Section 4.7.2.3. Appendix G sets forth the responses to the comments received on the DEIS within the comment period.

1.5 Cooperating Agencies

For the proposed PFSF in Skull Valley to be constructed and operate, the NRC, BIA, BLM, and STB must all approve certain aspects of the proposed action. Because each agency must take an action and because those actions are interrelated, the NRC, BIA, BLM, and STB have agreed to cooperate in the preparation of a single EIS.

The NRC is the lead agency in the preparation of this EIS. The preparation of a single EIS results in more efficient use of Federal resources. Each agency's action is described in the following paragraphs.

1.5.1 NRC Federal Action

On June 20, 1997, PFS applied to the NRC for a license to receive, transfer, and possess SNF and operate an ISFSI in the northwest corner of the Reservation. The initial period of the license would be for 20 years, and PFS indicated it may seek to renew the license for an additional 20 years. The NRC's decision-making process includes an environmental review (i.e., this FEIS) and safety review (see the discussion in the dialogue box) of the construction and operation of the proposed PFSF at the proposed site. Upon completion of both reviews, the NRC will decide whether to grant a license, with or without conditions, or deny the PFS request. Pursuant to 10 CFR 51.102(c), when a hearing is held on a proposed action, the initial decision of the presiding officer or the final decision of the Commissioners acting as a collegial body will constitute the Record of Decision (ROD).

The NRC safety regulations for an ISFSI are delineated in 10 CFR Part 72. Compliance with these regulations will provide reasonable assurance that the design and operation of an ISFSI will provide adequate protection of the public health and safety. NRC regulations for NEPA compliance are set forth in 10 CFR Part 51. Consistent with NEPA, NRC regulations require that an EIS be completed for major Federal actions significantly affecting the quality of the human environment. The Commission has determined that the licensing of an away-from-reactor ISFSI requires the preparation of an EIS.

BACKGROUND INFORMATION ON NRC's SAFETY REVIEW PROCESS

The NRC safety review of an ISFSI includes the preparation of a detailed report published asa Safety Evaluation Report (SER). The SER is based, in part, upon the Safety Analysis Report submitted by the applicant. The SER also includes the NRC's review of technical issues such as the adequacy of the facility design to withstand external events (i.e., earthquakes, floods, and tornadoes); radiological safety of facility operation, including doses from normal operations and accidents; emergency response plans; physical security of the facility; fire protection; maintenance and operating procedures; and decommissioning. The SER is a public document.

In addition to an SER for the ISFSI, NRC regulations require that an ISFSI use only storage and transportation cask designs that are licensed for use at the ISFSI and/or certified pursuant to 10 CFR Parts 72 and 71, respectively. For a cask design to be certified, the NRC must first complete a detailed review against the requirements of either 10 CFR Part 72 (for storage casks) or 10 CFR Part 71 (for transportation casks), or both for a dual-purpose shipping/storage cask. An SER would be completed for each cask and would describe the NRC's review of the adequacy of the cask design for technical issues such as the cask's ability to withstand external events (such as fires) and radiological impacts from normal use and accidents.

1.5.2 BIA Federal Action

A conditional lease between PFS and the Skull Valley Band was executed on May 23, 1997. PFS and the Skull Valley Band propose to enter into a lease for the site for 25 years, with an irrevocable option for an additional 25 years. The proposed lease would allow for the use of approximately 330 ha (820 acres) of land in the northwest corner of the Reservation for the proposed PFSF and 82 ha (202 acres) of land for a utility and road access corridor across tribal trust land, which includes rights-of-way for water pipelines, as well as for a buffer zone around the proposed PFSF. Only land uses currently existing on the buffer zone would be permitted unless consent is given by both parties. The Skull Valley Band cannot, under 25 USC Sections 177 and 415, convey an interest in Reservation land held in trust without approval of the United States. Therefore, BIA must review and either approve or disapprove the lease.

A determination to approve or disapprove the lease is made on a two-tiered decision process. The first tier is to determine whether the lease meets regulatory requirements for lease of tribal trust lands set forth in 25 CFR Part 162. The second tier of the decision process is documentation of NEPA compliance. After completing its regulatory review, including this FEIS, BIA will issue a ROD. The lease will not be approved or disapproved until the EIS is completed, commitments to mitigation measures identified in the BIA ROD are made, and the NRC issues a license to PFS.

Because of BIA's unique role in approving or disapproving the proposed lease, the purpose and need for its action differ from those of the NRC. The purpose of BIA's action is to promote the economic development objectives of the Skull Valley Band. The need for BIA's action is its government-to-government relationship with, and trust responsibility (including consideration of environmental impacts) to the Skull Valley Band. This difference has ramifications for the scope of BIA's NEPA review and the range of the BIA's reasonable alternatives. As part of its government-to-government relationship with the Skull Valley Band, BIA's NEPA review is limited to the scope of the proposed lease negotiated between the parties, not evaluation of actions outside the lease (e.g., ultimate disposition of the SNF). Similarly, the range of BIA's reasonable alternatives is limited to those that will serve the Skull Valley Band's economic development, consistent with the BIA's trust responsibility [i.e., the approval of the proposed PFSF site location(s) on the Reservation, or no action—disapproval of the lease]. PFS has identified an alternative site location on the Reservation (see Section 2.2.3). If BIA identifies this alternative site as the preferred alternative, it would require the Skull Valley Band and PFS to amend the proposed lease.

1.5.3 BLM Federal Action

1.5.3.1 Rights-of-Way and Resource Management Planning

By letter dated August 28, 1998, PFS applied to BLM for separate rights-of-way to provide transportation routes from the Interstate 80 corridor to the proposed PFSF site on the Reservation. The applicant's preferred route is a rail line from Skunk Ridge along the base of the Cedar Mountains on the western side of Skull Valley, then east to the proposed site (Figure 1.2). The alternative transportation mode is an ITF located 2.9 km (1.8 miles) west of the intersection of I-80 and Skull Valley Road (see Section 2.2.4.2). At the ITF, SNF would be transferred from railcars to heavy-haul vehicles and transported to the proposed PFSF via the Skull Valley Road.

The location of either the rail corridor or the ITF would occupy public land that is included within the BLM Pony Express resource management plan (RMP). The decisions in the current RMP do not provide for a major right-of-way, such as a rail line, along the west side of Skull Valley. The PFS proposal would, therefore, require an amendment to the RMP, *Transportation and Utility Corridor Decision 1*, prior to BLM granting the rail line right-of-way. The amendment would add an exception to the resource management plan decision to allow the construction and use of the proposed rail line outside the established corridors. This FEIS will serve as the NEPA document for BLM's determinations with respect to granting a right-of-way and the proposed plan amendment, should BLM approve the rail line right-of-way.

The following planning criteria have been established by BLM to guide the development of the amendment to the Pony Express RMP:

- The Plan will address only BLM lands administered by the Salt Lake Field Office and will not address private lands or lands administered by other government agencies.
- Coordination and cooperation across interagency administrative boundaries will take place in both planning and implementation.
- The public will have an opportunity to provide information and recommendations on the proposal and to review and comment on the proposed action before a final management decision.
- Social and economic impacts to local communities resulting from public land management will be considered.

BLM's action—dependent on NRC issuing a license and BIA approving a lease—is to issue a right-of-way grant under 43 CFR Part 2800 for the rail line, or for the ITF, or to deny both applications. If the rail line alternative is selected, BLM would require resolution of a planning restriction imposed by

Section 2815 of the National Defense Authorization Act for Fiscal Year 2000, and completion of the plan amendment process in accordance with 43 CFR Part 1600, prior to issuance of the right-of-way grant. BLM's review of the proposal will consider both technical and environmental issues. After completing its review, BLM will issue a ROD. The BLM also requires that certain "Critical Elements" be considered in this FEIS. Table 1.2 identifies these critical elements; those elements that have been found to have no effect are not further discussed in this FEIS and the rationale for their disposition is provided in Table 1.2.

1.5.3.2 Planning Consistency

The Federal Land Policy and Management Act (FLPMA), Title II, Section 202, provides guidance for the land use planning system of the BLM to coordinate planning efforts with Federally Recognized Indian Tribes, other Federal departments, and agencies of state and local governments. To accomplish this directive, Section 202 directs the BLM to keep apprized of state, local, and tribal plans; assure that consideration is given to those plans which are relevant; and assist in resolving, to the extent practical, inconsistencies between Federal and non-Federal government plans. The FLPMA goes on to state in Subsection (c) (9) that *"Land use plans of the Secretary under this section shall be consistent with State and local plans to the maximum extent he finds consistent with Federal law and the purposes of this Act."* The provisions of this section of the FLPMA are echoed in 43 CFR 1610.3, BLM Resource Management Planning regulations.

Other Federal plans reviewed included the DOE's 1992 Western Regional Corridor Study. The study identified a route along the west side of Skull Valley for a transmission corridor. The suggested corridor is located in the same vicinity as the proposed rail line. It is important to note that the study is not a decision document, rather it is a document which the BLM committed to use as a reference when considering land use decisions.

Additionally, the Tooele County General Plan has been reviewed and found consistent with the land use plans of the proposed project. In a letter dated September 18, 2000, the Tooele County Commission stated its support for the proposed action. The General Council and the Executive Committee of the Skull Valley Band has approved the proposed action.

The proposed plan amendment is not known to be inconsistent with state resource plans. There may be inconsistencies, however, with State law regarding the transport or storage of high level nuclear waste.

1.5.4 STB Federal Action

The STB has regulatory authority over the construction and operation of new rail lines in the United States. The STB would have to grant a license for the construction and operation of PFS's proposed rail line from Skunk Ridge. On January 5, 2000, PFS filed an application with STB for the proposed rail line construction and operation (Finance Docket 33824, *Great Salt Lake and Southern Railroad, L.L.C.–Construction and Operation in Tooele County, Utah*). STB will take its action considering both the merits of the proposal and the potential environmental impacts. STB will prepare a ROD providing the basis for its decision to either grant or deny the PFS application with appropriate conditions, including environmental conditions.

Table 1.2. Critical elements identified by BLM and considered in this FEIS

Indirect/direct cumulative effect	No effect	Value	Rationale for BLM's determination of "no effect"
X		Air quality	
X		Threatened and endangered species	
X		Flood plains	
	X	Prime/unique farmland	There are no prime/unique farmlands present in this area.
X		Cultural/historical resources	
	X	Paleontological	No surveys have been performed in this area, and the authorized BLM officer is not aware of any paleontological resources that would be affected by the proposed action.
X		Wilderness	
X		Water resources	
	X	Areas of critical environmental concern (ACEC)	There are no ACECs in western Skull Valley.
	X	Wild & scenic rivers	There are no rivers or creeks in the Cedar Mountains suitable for wild and scenic designation.
X		Native American concerns	
X		Wastes, hazardous/ solid	
X		Environmental justice	
	X	Riparian	There are no riparian areas that would be crossed by the proposed rail corridor. Travel along the existing Skull Valley highway would not directly affect riparian areas
X		Noxious weeds	

1.5.5 Required Agency Consultation

The Cooperating Federal Agencies, NRC, BIA, BLM, and STB, are required to comply with the Endangered Species Act of 1973, as amended, and the National Historic Preservation Act of 1966 (NHPA), as amended.

1.5.5.1 Endangered Species Act Consultation

The Cooperating Federal Agencies have consulted with the U.S. Fish and Wildlife Service (FWS) to comply with the requirements of Section 7 of the Endangered Species Act of 1973 (see Appendix B). On June 14, 1999, the Cooperating Federal Agencies sent a letter to the FWS's Utah Field Office describing the proposed action and requesting a list of threatened and endangered species and critical habitats that could potentially be affected by the proposed action. By letter dated June 22, 1999, the FWS's Utah Field Office provided a list of threatened, endangered, and conservation agreement species. By letter dated June 16, 2000, the Cooperating Federal Agencies requested that the FWS concur in the agencies' finding that the proposed action will not adversely effect any listed threatened or endangered species. By letter dated June 30, 2000, the FWS concurred with the Cooperating Agencies' no adverse effect determination. Prior to the construction of the proposed facility, the list of threatened and endangered species will be updated and additional surveys will be conducted in accordance with the update.

1.5.5.2 National Historic Preservation Act (NHPA) Section 106 Consultation

The Cooperating Federal Agencies have offered State agencies, Federally Recognized Indian Tribes and other organizations that may be concerned with the possible effects of the proposed action on historic properties, an opportunity to participate in the consultation process required by Section 106 of the NHPA (see Appendix B). The following is a list of agencies, tribes, and organizations contacted during the consultation process:

A. Utah State Historic Preservation Officer (SHPO)

By letter dated May 18, 1999, the Cooperating Federal Agencies initiated the Section 106 process with the Utah State Historic Preservation Officer (SHPO). This letter described the potentially affected area and requested the views of the SHPO on further actions to identify historic properties that may be affected. The Utah SHPO responded by letter dated June 24, 1999. The Utah SHPO identified three additional actions it thought the Cooperating Federal Agencies should take in their effort to identify historic properties that may be affected by the proposed action (see Appendix B).

Subsequent to the Cooperating Federal Agencies letter of May 18, 1999, revised regulations, as issued by the Advisory Council on Historic Preservation (Council), became effective. As a result, the Cooperating Federal Agencies recommended in a letter dated November 9, 1999, that the new regulations be implemented for this Section 106 consultation process. In a letter dated November 23, 1999, the Utah SHPO agreed to proceed with the consultation pursuant to the revised regulations.

Subsequent to this, the Utah SHPO appeared to cease active participation in the process. On October 10, 2000, the Utah SHPO declined to meet with the Cooperating Federal Agencies to discuss eligibility recommendations for potentially historically significant sites within the Area of Potential Effect (APE), and to discuss possible mitigation measures to minimize or eliminate any adverse effect. He referred the agencies to the Utah Governor's office. By letter dated October 19, 2000, the Cooperating Federal Agencies requested a clarification of the Utah SHPO's role in the consultation process. In the letter, the Cooperating Federal Agencies stated that failure to respond to the letter would be interpreted as a withdrawal from the consultation process. By letter dated November 1, 2000, the Governor of Utah, Michael O. Leavitt, informed the NRC that he retained the authority of the Utah SHPO and designated the Governor's State Planning Coordinator as the State's representative for the consultation process. By letters dated December 5, 2000, to the Governor and Governor's State Planning Coordinator, the Cooperating Federal Agencies acknowledged the reassignment of the SHPO's responsibilities within the Utah Governor's Office. The Cooperating Agencies have communicated with the Utah Governor's office to continue the consultation process.

B. Federally Recognized Indian Tribes

In response to the Utah SHPO's letter dated June 24, 1999, BLM (by letters dated July 1, 1999, and December 28, 1999) and NRC (by letter dated April 26, 2000) contacted regional Federally Recognized Indian Tribes soliciting their interest in being consulting parties in the Section 106 consultation process for the proposed project. By letter dated July 9, 1999, the Confederated Tribes of the Goshute Reservation informed BLM of their interest in participating in the consultation process. No other Federally Recognized Indian Tribes responded initially.

During follow-up calls, the Northwestern Band of Shoshoni Nation (on September 27, 2000) and the Northern Ute Indian Tribe (on January 3, 2001) declined to participate in the consultation process and indicated that neither were aware of properties of traditional and cultural significance within the APE. The Te-Moak Tribes of Western Shoshone Indians of Nevada, during a follow-up call on September 27, 2000, indicated they would like to participate in the consultation process. The Paiute Indian Tribe of Utah, on October 25, 2000, (and December 6, 2000, at the Tribal Council monthly meeting), informed the Cooperating Federal Agencies that the Tribe declined to be a consulting party but would like to be kept informed of the project. By letter dated October 16, 2000, the Cooperating Federal Agencies solicited concurrence from the interested Indian Tribes regarding eligibility determinations for archaeological and historic sites along the proposed rail line. Details of this consultation are presented in Appendix B.

C. Other Organizations

Additionally, in accordance with 36 CFR 800.3(f), the Cooperating Federal Agencies contacted local interested organizations, by letters dated December 28, 1999, April 26, 2000, and October 16, 2000, and by follow-up calls, soliciting their interest in being consulting parties in the Section 106 consultation process for the proposed project and their knowledge of cultural resources within the APE. By letter dated September 13, 2000, the Cooperating Federal Agencies also contacted Ohngo Gaudadeh Devia (OGD) to solicit information regarding cultural resources. The Utah Chapter of the Oregon-California Trail Association, the National Park Service (Long Distance Trails Office), member organizations of the Utah Historic Trails Consortium, and OGD informed BLM that they would like to participate in the consultation process. The National Railway Historical Society, Iosepa Historical Society, and U.S. Army Dugway Proving Ground indicated that they did not want to participate.

D. Advisory Council on Historic Preservation

By letter dated June 22, 2000, the Cooperating Federal Agencies notified the Council that the proposed action would result in an adverse effect on the Hastings Cutoff Trail, and other resources that have not been fully evaluated to determine their cultural significance. By letter dated June 28, 2000, the Council acknowledged notification and supporting documentation regarding the adverse effect of the project on properties eligible for inclusion in the *National Register of Historic Places (National Register)*. The Council informed the Cooperating Federal Agencies that based on the information provided, the Council's participation was not needed in the consultation process to resolve the adverse effects. Furthermore, the Council stated that pursuant to 36 CFR 800.6(b)(iv), the Cooperating Federal Agencies would need to file a final Memorandum of Agreement (Agreement), developed in consultation with the Utah SHPO, and related documentation at the conclusion of the consultation process, in accordance with Section 106 of the NHPA.

By letter dated November 27, 2000, the Cooperating Federal Agencies requested the Council's participation in the consultation process and in development of the Agreement based on the unique circumstances associated with the Utah Governor's participation in the consultation process. By letter dated December 18, 2000, the Council agreed to participate in the consultation process. By agreeing to participate in the consultation process, the Cooperating Federal Agencies consulted with the Council to seek ways to avoid, minimize or mitigate the adverse effects of the project, as described in the "Summary of Consultation Activities," below.

E. Summary of Consultation Activities

In May and June of 1999 and in June 2000, a PFS contractor, P-III Associates, performed a Class III cultural resources inventory in Skull Valley, Utah. All portions of the APE were included in the study area. BLM representatives met with representatives of the Lincoln Highway Association and its Utah Chapter on January 11, 2000, and with the Utah Historic Trails Consortium and its member organizations on April 27, 2000, to discuss preliminary results of the inventory. On January 11, the Utah Chapter of the Lincoln Highway Association expressed concern about possible impacts to the Victory Highway and U.S. Highway 40 in the Skunk Ridge siding area. During the April 27, 2000, meeting, a member of the Oregon California Trail Association stated that there were two historic trails in the southern part of the rail corridor and that these trails were being overlooked.

Additional information on these resources was collected during June 2000, enabling these concerns to be addressed. This information was included in the final report documenting the cultural resource inventory. Copies of the report were provided to the consulting parties including the Skull Valley Band, the Confederated Tribes of the Goshute Reservation, Paiute Indian Tribe of Utah, Te-Moak Tribes of Western Shoshone Indians of Nevada, OGD, and member organizations of the Utah Historic Trails Consortium. For all sites within the APE, the report includes a recommendation with regard to each site's eligibility for inclusion in the *National Register*. The Cooperating Federal Agencies reviewed the report and concurred with the eligibility determinations. By letter dated October 6, 2000, the Cooperating Federal Agencies requested the Utah SHPO's concurrence on the eligibility recommendations. By letter dated October 16, 2000, the Cooperating Federal Agencies requested concurrence on the eligibility recommendation from other consulting parties.

Additionally, on July 27, 2000, and during the week of October 23-27, 2000, the Cooperating Federal Agencies met with representatives of the consulting parties to discuss the eligibility recommendations included in the report and potential mitigation measures for anticipated adverse impacts to the cultural resources within the APE. By letter dated October 31, 2000, the Lincoln Highway Association concurred with the eligibility determination. By letter dated October 25, the Utah Chapter of Lincoln Highway Association concurred with the eligibility determination. By letter dated November 10, 2000, the National Park Service (Long Distance Trails Office) concurred with the eligibility determinations. On November 14, 2000, the Confederated Tribes of the Goshute Reservation were contacted regarding the tribal elders' review of the project (see Appendix B). No properties of cultural and traditional significance to the Confederated Tribes of the Goshute Reservation within the APE were identified. The other consulting parties did not respond to the request for concurrence. Accordingly, concurrence with the eligibility determinations was presumed from the other consulting parties.

The details of a follow-up call with OGD are presented in Appendix B. The Cooperating Federal Agencies, after careful consideration of the information on cultural resources provided from OGD, determined that OGD would be granted consultation status. In addition, however, the Cooperating Federal Agencies determined that the substantive information OGD provided involved issues that were already being considered as a part of the Section 106 consultation process.

By letters dated December 1, 2000 and December 2, 2000, the Cooperating Federal Agencies requested concurrence on the determination of adverse effects on properties that were eligible for inclusion in the *National Register* from the other consulting parties. As a consequence of the finding of adverse effect, a draft Agreement was included with the letters. The Agreement outlines agreed-upon measures that PFS shall take to avoid, minimize, or mitigate these adverse effects. Additionally, the Agreement contains a commitment to develop a Treatment Plan that includes specific mitigation measures for cultural resources within the APE.

The Confederated Tribes of the Goshute Reservation declined concurrence by letter dated December 8, 2000. By letter dated December 14, 2000, the Lincoln Highway Association concurred with the determination of adverse effect. The Skull Valley Band concurred with the determination of adverse effects and commented on the draft Agreement by letter dated December 22, 2000. The National Park Service (Long Distance Trails Office) and the Utah Historic Trails Consortium also concurred and provided comments by letters dated December 18, 2000, and January 31, 2001, respectively. By letter dated February 8, 2001, the Cooperating Agencies extended the time to review the determination of adverse effects and the draft Agreement, based upon the requests of the member organizations of the Utah Historic Trails Consortium and the Council. The Council and PFS offered comments for consideration in finalizing the Agreement by letters dated February 15, 2001, and February 28, 2001, respectively.

Based on the comments received from the consulting parties, the draft Agreement was revised. By letter dated June 19, 2001, the Cooperating Federal Agencies requested comments on the revised draft Agreement. PFS, the National Park Service (Long Distance Trails Office), and the Council provided comments by letters dated June 28, 2001, July 5, 2001, and July 6, 2001, respectively. By letter dated June 29, 2001, the SHPO requested an extension of the review period and provided comments by letter dated August 6, 2001. Concurrence with the eligibility determinations was presumed from the other consulting parties. The Agreement will be finalized before the Cooperating Agencies issue their respective RODs.

A draft Treatment Plan reflects recommendations provided by the consulting parties to PFS by letter dated December 12, 2000. By letter dated April 20, 2001, the Council provided comments on the draft Treatment Plan. By letter dated March 19, 2001, the Cooperating Federal Agencies requested concurrence from the SHPO on the eligibility determination for the Rock Alignment and Cairn. No response was received and concurrence with the eligibility determination on the Rock Alignment and Cairn was therefore presumed from the SHPO.

1.6 Federal, Tribal, and State Authorities, Regulations, and Permits

This section describes the applicable Federal, Tribal, and State regulations governing the construction and operation of the proposed PFSF and transportation facilities with which PFS must comply. Section 1.6.1 identifies the potentially applicable statutes and regulations that require compliance, while Section 1.6.2 identifies the potentially required permits and provides the status of PFS's applications to obtain these permits. This information was obtained from the PFS's Environmental Report (PFS/ER 2001) and other sources (e.g., PFS/RAI2 1999a).

1.6.1 Statutes and Regulations

1.6.1.1 Federal Laws and Regulations

The proposed PFSF is subject to a number of Federal environmental laws, regulations, and other regulatory requirements: The following list identifies generally applicable laws and regulatory requirements:

- the Atomic Energy Act of 1954 as amended (42 USC 2011 *et seq.*), which gives NRC specific authority to regulate the possession, transfer, storage, and disposal of byproduct and special nuclear materials, as well as aspects of transportation packaging design requirements for these materials, including testing for packaging certification. Commission regulations applicable to the transportation of these materials (10 CFR Parts 71 and 73) require that shipping casks meet specified performance criteria under both normal transport and hypothetical accident conditions.
- NEPA (42 USC 4321 *et seq.*).
- CEQ's general regulations implementing NEPA (40 CFR Parts 1500–1508).
- NRC regulations implementing NEPA (10 CFR Part 51).
- the Resource Conservation and Recovery Act, as amended (RCRA; 42 USC 6901 *et seq.*), which governs treatment, storage, and disposal of solid waste.
- the Clean Air Act (CAA), as amended (CAA; 42 USC 7401 *et seq.*). The CAA requires (1) Federal agencies to comply with "all Federal, State, interstate, and local requirements" related to the control and abatement of air pollution; (2) the Environmental Protection Agency (EPA) to establish National Ambient Air Quality Standards (NAAQS); and (3) establishment of national standards of performance for new or modified stationary sources of atmospheric pollutants. It further regulates emission of hazardous air pollutants, including radionuclides, through the National Emission Standards for Hazardous Air Pollutants Program (40 CFR Parts 61 and 63).
- the Clean Water Act (CWA) of 1977 (CWA; 33 USC 1251 *et seq.*), which generally requires (Section 113) all Federal departments and agencies to comply with Federal, State, interstate, and local requirements regarding discharge of pollutants to surface water bodies. Section 402(p) of the CWA (which was added to the CWA by the Water Quality Act of 1987) requires EPA to establish regulations for the Agency or individual states to issue permits for stormwater discharges associated with industrial activity, which includes construction activities that could disturb one or more acres.
- the Endangered Species Act (ESA), as amended (16 USC 1531 *et seq.*), which protects threatened and endangered species and their habitats from major adverse impacts. The ESA further requires consultation regarding these species with the FWS.
- The Bald and Golden Eagle Protection Act of 1940, as amended (16 USC 668-668d), which provides for the protection of the bald eagle and the golden eagle by prohibiting the taking, possession, and commerce of such birds, their nests, and their eggs. The Act prescribes criminal and civil penalties for persons violating the conventions identified in 16 USC 668.
- The Migratory Bird Treaty Act of 1918, as amended (16 USC 703-712), which protects migratory birds included in the terms of the conventions identified in 16 USC 703.
- Executive Order 11514, *National Environmental Policy Act, Protection and Enhancement of Environmental Quality*. The Order directs Federal executive agencies to monitor and control their activities continually to protect and enhance the quality of the environment, and it requires the development of procedures both to ensure the fullest practicable provision of timely public information and understanding of Federal plans and programs with potential environmental impacts, and to obtain the views of interested parties.

- Executive Order 11593, *Protection and Enhancement of the Cultural Environment*, directs Federal executive agencies to locate, inventory, and nominate properties under their jurisdiction or control to the *National Register of Historic Places*.
- Executive Order 11988, *Floodplain Management*, directs Federal executive agencies to establish procedures to ensure that any Federal action undertaken in a floodplain considers the potential effects of flood hazards and floodplain management and avoids floodplain impacts to the extent practicable.
- Executive Order 11990, *Protection of Wetlands*; Federal executive agencies are directed to avoid to the extent possible the long and short term adverse impacts associated with the destruction or modification of wetlands and to avoid direct or indirect support of new construction in wetlands wherever there is a practicable alternative.
- Executive Order 12088, *Federal Compliance with Pollution Control Standards*. The Order generally directs Federal executive agencies to comply with applicable administrative and procedural pollution control standards established in major Federal environmental legislation, such as the CAA, CWA, and Safe Drinking Water Act (SDWA).
- Executive Order 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations*, which directs Federal executive agencies, to the extent practicable, to make the achievement of environmental justice part of their mission by identifying and addressing disproportionately high and adverse human health or environmental effects of their programs, policies, and activities on minority and low-income populations in the United States, including Federally Recognized Indian Tribes.
- Executive Order 13007, *Indian Sacred Sites*, which directs Federal executive agencies to avoid adverse effects to sacred sites and to provide access to those sites to Native Americans for religious practices.
- Executive Order 13175 (as revised and updated November 6, 2000), *Consultation and Coordination with Indian Tribal Governments*. The Order directs Federal executive agencies to establish regular and meaningful consultation and collaboration with Tribal governments in the development of regulatory practices on Federal matters that significantly or uniquely affect their communities.
- Executive Order 13112—*Invasive Species*; Federal executive agencies, to the extent practicable and permitted by law, are required to, among other things, prevent the introduction of invasive species, detect and respond rapidly to and control populations of such species, and develop technologies to prevent introduction and to provide for environmentally sound control of invasive species.
- the Federal Land Policy and Management Act of 1976 (43 USC 1701 *et seq.*), which governs the use of Federal lands administered by BLM. Title II and its implementing regulations in 43 CFR Part 1600 governs land use planning. Title V and its implementing regulations in 43 CFR Part 2800 governs rights-of-way that cross public land administered by the BLM.
- the National Historic Preservation Act (16 USC 470 *et seq.*) and related historic preservation laws [e.g., the Antiquities Act (16 USC 431 *et seq.)*] provide for the protection and preservation of cultural and historic resources.
- the American Indian Religious Freedom Act (42 USC 1996 *et seq.*)
- the Archaeological Resources Protection Act, as amended (16 USC 470aa *et seq.*) would apply if there were any excavation or removal of archaeological resources from publicly held or Indian trust lands.
- provisions of the Native American Graves Protection and Repatriation Act of 1990 (25 USC 3001) would apply if there were any discoveries of Native American graves or grave artifacts.

- the Noise Control Act of 1972, as amended (42 USC 4901 *et seq.*) would apply to any noise-generating activities carried out during the construction, operation, or closure of the proposed facility.
- the Occupational Safety and Health Act (29 USC 651 *et seq.*) and its implementing regulations (29 CFR 1900 *et seq.*).
- NRC's regulations in 10 CFR Part 20, *Standards for Protection Against Radiation,* and in 10 CFR Part 72, *Licensing Requirements for the Independent Storage of Spent Nuclear Fuel and High-Level Radioactive Waste*.
- the Pollution Prevention Act of 1990 (42 USC 13101 *et seq.*), which establishes a national policy for waste management and pollution control that focuses first on source reduction, and then on environmentally safe recycling, treatment, and disposal.
- the requirements for the Secretary of the Interior or a delegated representative to approve business leases with Federally Recognized Indian Tribes (25 U.S.C. 415 and implementing regulations in 25 CFR Part 162).
- the Safe Drinking Water Act (enforcement of drinking water standards has been delegated by EPA to the States; regulations are found at 40 CFR Parts 123, 141, 145, 147, and 149).

Cross-country and local transportation of SNF to the proposed PFSF site would require compliance with the NRC's regulations in 10 CFR Part 71, *Packaging and Transportation of Radioactive Material*. The regulations in 10 CFR Part 73, *Physical Protection of Plants and Materials* govern safeguards and physical security during the shipment of SNF. The transportation aspects of the proposed project would also require compliance with applicable Department of Transportation (DOT) regulations, such as those found in 49 CFR and its subchapters as listed below:

- Chapter I, Subchapter A: *Hazardous Materials Transportation, Oil Transportation, and Pipeline Safety*; Part 107, *Hazardous Materials Program Procedures;*
- Subchapter C: *Hazardous Materials Regulations*; Part 171, *General Information, Regulations, and Definitions*; Part 172, *Hazardous Materials Table, Special Provisions, Hazardous Materials Communications, Emergency Response Information, and Training Requirements*; Part 173, *Shippers—General Requirements for Shipments and Packagings*, Subpart I, *Radioactive Materials*;
- Part 174, *Carriage by Rail;*
- Part 177, *Carriage by Public Highway*.

Also, the action would be required to comply with the DOT Federal Highway Administration regulations in 49 CFR Chapter III, Subchapter B: *Federal Motor Carrier Safety Regulations*; including:

- Part 390, *Federal Motor Carrier Safety Regulations, General*;
- Part 391, *Qualifications of Drivers*;
- Part 392, *Driving of Commercial Motor Vehicles*;
- Part 393, *Parts and Accessories Necessary for Safe Operation*;
- Part 395, *Hours of Service of Drivers*;
- Part 396, *Inspection, Repair, and Maintenance*; and
- Part 397, *Transportation of Hazardous Materials; Driving and Parking Rules*.

1.6.1.2 Skull Valley Band of Goshute Indians Tribal Statutes and Regulations

Activities that would occur on the Reservation would be required to comply with Tribal laws, regulations, and ordinances, including those Federal laws (e.g., CWA, Safe Drinking Water Act, and CAA) which allow a Tribe to be treated as a sovereign government or subfederal government.

1.6.1.3 State of Utah Statutes and Regulations

Those activities that would take place outside the Reservation (e.g., along the transportation corridor) would be required to comply with applicable Utah statutes and regulations in the Utah Administrative Code under Environmental Quality (Sections R307 to R317).

1.6.2 Required Permits and Approvals

Many of the Federal, Tribal, and State statutes and regulations identified in Section 1.6.1 require permits or approvals to demonstrate compliance. PFS has identified a number of permits and approvals that need to be developed and approved for the proposed action.[3] The sections below list the permits and approvals that have been identified by PFS and the status of PFS's applications to obtain them.

1.6.2.1 Federal Permits and Approvals

U.S. Nuclear Regulatory Commission: A license is required from the NRC. For a more detailed discussion see Section 1.5.1.

U.S. Department of Interior, Bureau of Indian Affairs: BIA approval of the lease between PFS and the Skull Valley Band is needed. For a more detailed discussion see Section 1.5.2.

U.S. Department of Interior, Bureau of Land Management: A right-of-way approval for either a new rail line or an ITF is needed. For a more detailed discussion see Section 1.5.3.

U.S. Surface Transportation Board: The STB would have to approve construction and operation of the new rail line and associated sidings. For a more detailed discussion, see Section 1.5.4.

U.S. Environmental Protection Agency: (1) National Pollutant Discharge Elimination System (NPDES)—With respect to all construction activity on the Reservation, a NPDES General Permit is available from EPA Region VIII to cover construction projects disturbing 0.4 ha (1 acre) or more on all tribal trust lands in Utah. However, PFS has provided information to EPA Region VIII indicating that no jurisdictional wetlands or other types of waters of the United States are located at the proposed site for the PFSF or along the proposed railroad alignment, nor do ephemeral drainages in these areas reach any jurisdictional waters. Based on this information, PFS has stated that it does not intend to apply for a NPDES permit.
(2) SDWA—All necessary registrations needed to ensure compliance with the Act and its enabling regulations regarding the use of on-site drinking water wells would be secured from EPA Region VIII. (3) Registration of Septic Tank/Leach Fields—Because the two proposed PFSF septic tank/leach field systems would qualify as Class V injection wells, an Underground Injection Control inventory form would be filed with EPA before the systems are placed into service.
(4) RCRA—EPA has RCRA authority over activities on the Reservation. The proposed PFSF is not expected to generate large quantities of hazardous wastes (as regulated under RCRA); therefore, the PFSF would likely be classified as a Conditionally Exempt Small Quantity Generator (CESQG). PFS will pursue obtaining a RCRA identification number from EPA Region VIII for use in documenting the management, tracking, and disposal of any small quantities of

[3]PFS has recorded in its Environmental Report (see PFS/ER 2001) its disagreement with the State of Utah concerning the permits, licenses, approvals, and other entitlements that must be obtained in connection with the PFS ISFSI license application.

hazardous waste. (5) Spill Control—PFS provided information that there is no reasonable expectation, even in the absence of any oil containment or control equipment, that a discharge of oil from the proposed PFSF would reach a jurisdictional water of the United States. Therefore, the proposed PFSF is not expected to require a Spill Prevention, Control, and Countermeasures (SPCC) plan.

U.S. Department of Interior, Fish and Wildlife Service: No specific permit or approval is needed from the FWS. However, a required consultation process has been conducted and completed between the Cooperating Federal Agencies and the FWS (see Section 1.5.5).

U.S. Department of Defense, Army Corps of Engineers (ACE): An extensive survey of the proposed rail corridor was undertaken in October 2000 to determine if any jurisdictional waters of the United States—particularly wetlands or perennial, intermittent, or ephemeral streams—are present along the proposed railroad alignment. This assessment was made to determine PFS's permitting obligations under CWA Section 404 (the dredge and fill permit program). The survey, which reflects the characteristics of the entire region, concluded that there are no jurisdictional wetlands or other waters along the proposed alignment. Furthermore, the ephemeral drainages in the region possess no characteristic ecosystems and end without reaching any jurisdictional water of the United States. The ACE has concurred with the survey's findings in a letter dated February 1, 2001, from the Chief, Utah Regulatory Office, U.S. Army Corps of Engineers. Therefore, no CWA Section 404 permit would be required.

1.6.2.2 Skull Valley Band of Goshute Indians Tribal Permits and Approvals

No specific permits are required at this time.

1.6.2.3 State of Utah Permits and Approvals for Activities Off the Reservation

Utah Department of Environmental Quality: The State of Utah regulates proper disposition of storm water through a Utah Pollution Discharge Elimination System (UPDES) General Permit (UAC R137-8-3.8). The UPDES is required for construction activities that disturb more than 0.4 ha (1 acre) in order to secure coverage under the UPDES permit authorizing construction-related storm water discharges. Since the construction activities for the rail line or the ITF would exceed this acreage limit, PFS would submit a notice of intent (NOI) at least 48 hours prior to initiation of construction activities. Before submitting the NOI, PFS would prepare a Storm Water Pollution Prevention Plan and would meet all other pre-permit application requirements as outlined in the UPDES General Permit.

Utah Department of Environmental Quality: A construction and operation license could be required for the ITF under UCA 19-3-301, 19-3-304, and 19-3-318 SF, which cover high-level nuclear waste transfer, storage, decay in storage, treatment, or disposal facilities. Utah defines a transfer facility as including any facility which transfers waste from and between transportation modes (as would occur at the ITF for this project). The Utah license would require the approval of the state Legislature and the Governor.

Utah Department of Transportation: In the event that heavy-haul vehicles are used to transport licensed SNF shipping casks on Skull Valley Road, a road-use permit would have to be obtained from the State because of the size and weight of the proposed vehicles.

Utah Department of Transportation: No tract of any railroad may be constructed across a public road, highway, or street at grade without the permission of the Utah Department of Transportation. PFS would be required to obtain that permission for such railroad construction, if any, meeting the stated conditions.

Utah State Historic Preservation Office (SHPO): While a specific permit is not required directly from the SHPO, PFS must comply with the terms of the Agreement completed between the parties of the consultation process required by Section 106 of NHPA (see Section 1.5.5).

Utah State Engineer: For the proposed rail corridor, PFS would be required to file an application to obtain a Stream Alteration Permit from the Utah State Engineer to satisfy CWA Section 401 water quality certification requirements, The State Engineer would certify that the proposed construction activities would not cause an exceedance of State water quality standards or otherwise be in violation of a State requirement.

Utah State Division of Water Rights: Water rights in Tooele County are regulated by the State, which allocates use through water rights processes. Any use of surface water or groundwater in Skull Valley other than on the Reservation by PFS would be subject to these processes.

Utah State legislation concerning high-level nuclear waste: The State of Utah enacted legislation in Utah S.B. 81 (2001) establishing extensive (and possibly prohibitive) requirements relating to the transportation, transfer, or storage of high-level nuclear waste within the exterior borders of the State. The legislation amends UCA 17-27-102, 17-27-301, 17-27-303, 17-34-1, 17-34-3, 19-3-301, 19-3-302, 19-3-303, 19-3-308, 19-3-309, 19-3-312, 34-38-3, and 73-4-1; and enacts UCA 17-27-308, 17-34-6, and 19-3-319. These provisions would affect PFS and private parties and governmental entities that may wish to enter into agreements with PFS in connection with the transportation, transfer, or storage of nuclear waste within the exterior borders of the State of Utah. This legislation is also currently being challenged by the Band and PFS [Skull Valley Band of Goshute Indians and Private Fuel Storage v. Leavitt, Civil No. 2:01CV00270C (D. Utah, filed April 19, 2001)].

2. ALTERNATIVES INCLUDING THE PROPOSED ACTION

This section presents the details of the proposed action (i.e., construction and operation of the proposed PFSF and the new rail line), as well as reasonable alternatives to the proposed action that have been considered and evaluated in this FEIS. The information presented in this section provides the basic project information upon which the potential impacts have been assessed in Chapters 4, 5, and 6 of this FEIS.

Section 2.1 describes the details of constructing and operating the proposed facility at the Reservation. Most of this information was provided in PFS's Environmental Report (PFS/ER 2001) and Safety Analysis Report (PFS/SAR 2001). Section 2.1 also provides the details of transporting SNF through Skull Valley.

Section 2.2 discusses (a) alternative storage technologies, (b) PFS's site selection process, (c) an alternative location for the proposed PFSF on the Reservation, (d) alternative modes of transporting SNF, and (e) the no-action alternative. Section 2.2 also discusses an alternate site located in Wyoming. The no-action alternative (i.e., not constructing the proposed PFSF or its associated transportation facilities) is included to provide a basis for comparing and evaluating the potential impacts of constructing and operating the proposed facility.

A comparison of the potential environmental impacts of the alternatives is presented in Chapter 9.

2.1 Proposed Action

The proposed action considered in this FEIS is the construction and operation of the proposed PFSF on the Reservation and the construction and operation of a new rail line. Implementation of the proposed action would require the following Federal actions: BLM approval of an amendment to the Pony Express RMP and granting a right-of-way approval for the use of public lands managed by BLM for a new rail line through Skull Valley; STB approval of the construction and operation of this new rail line; the issuance of an NRC license for the proposed PFSF; and BIA approval of a lease for the use of tribal trust lands allowing for the construction and operation of the proposed PFSF. An overview of the proposed project is given in Section 1.2. This section provides a more detailed description of the construction and operation of the proposed PFSF and transportation options. Upon approval by each of the Cooperating Federal Agencies, and satisfaction of any other necessary requirements PFS would proceed with constructing and operating the proposed PFSF, under conditions prescribed by the BIA, BLM, STB, and NRC, as appropriate.

2.1.1 Proposed Site and Description of Associated Facilities

2.1.1.1 Site Description

The proposed site is approximately 93 km (58 miles) straight-line distance southwest of Utah's State Capitol Building [or about 120 km (75 miles) by road] and approximately 44 km (27 miles) west-southwest of Tooele (see Figure 1.1). The proposed site is located on the Reservation within the geographic boundaries of Tooele County, Utah, about 6 km (3.5 miles) west-northwest of the Skull Valley Band's village (see Figure 2.1). Approximately 30 people live on the Reservation, and the

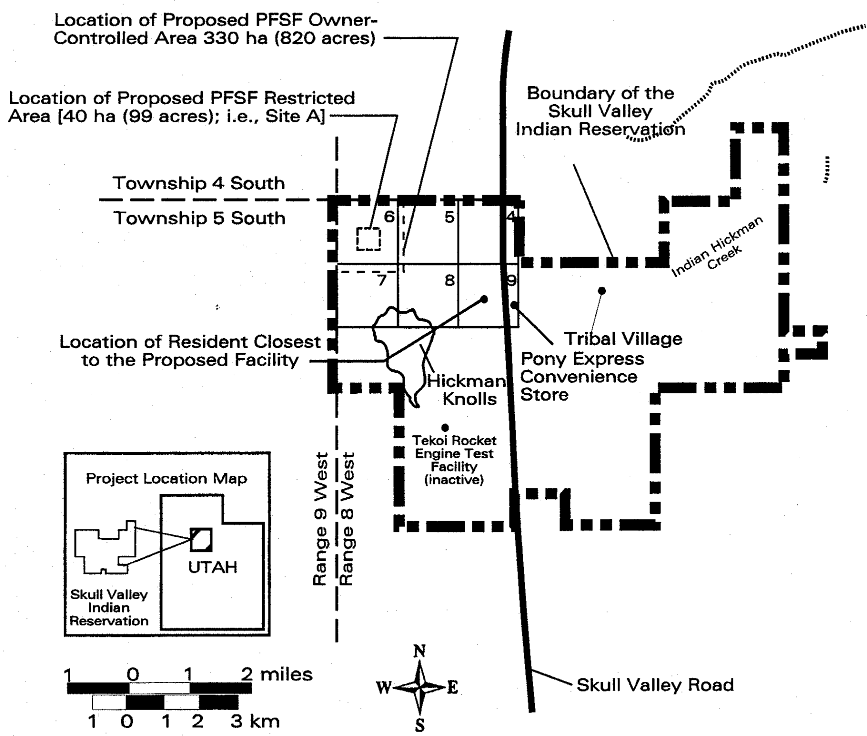

Figure 2.1. Location of the proposed site (i.e., Site A) for the PFSF on the Reservation.

resident's home nearest to the site is about 3 km (2 miles) to the east-southeast. PFS plans to lease 330 ha (820 acres) from the Skull Valley Band in the northwest corner of the Reservation. As shown in Figure 2.1, the property to be leased occupies all of Section 6 and portions of Sections 5, 7, and 8 in Township 5 South (T5S), Range 8 West (R8W). The northwest corner of the proposed 40-ha (99-acre) facility is at 40° 24' 50" north latitude and 112° 47' 37" west longitude. The area immediately around these sections is undeveloped rangeland owned by the Skull Valley Band, public lands managed by the BLM, and privately owned land.

The site is on a relatively flat valley floor, with elevations ranging from about 1,355 m (4,450 ft) above sea level at the northwest corner of the site to 1,370 m (4,490 ft) at the southeast corner. The Stansbury Mountains [with elevations up to 3,300 m (11,000 ft)] lie approximately 8 km (5 miles) to the east of the site, while the Cedar Mountains [with elevations up to 2,300 m (7,700 ft)] lie about 13 km (8 miles) to the west.

Additional detail on the existing environment at the proposed site is contained in Section 3 in this FEIS.

2.1.1.2 Facility Description

The basic site plan for the proposed PFSF is shown in Figure 2.2. A fence would mark the boundaries of the 330-ha (820-acre) leased area, designated for the purposes of this FEIS as the Owner Controlled Area (OCA)[1], and a 40-ha (99-acre) restricted-access area within the OCA (see Figure 2.1) would contain the storage pads and some of the support facilities. The restricted-access area would be located at the approximate center of the OCA. The entire OCA would be enclosed by a typical four-strand barbed wire range fence, which would meet the requirements of the BIA. Fencing around the restricted-access area would consist of two 2.4-m (8-ft) chain link security fences topped with barbed wire. The inner fence would be separated from the outer chain link nuisance fence by a 6-m (20-ft) isolation area. A new 4-km (2.5-mile) access road would lie within an 82-ha (202-acre) right-of-way on the Reservation (see Figures 2.1 and 2.2). The road would be built east of the site and would connect the site to the existing Skull Valley Road. No fence would be constructed to enclose the new access road. Buildings and storage areas would primarily be located within the restricted-access area, with the exception of the Administration Building, Concrete Batch Plant, and Operations and Maintenance Building, which would be located on the site outside the security fences. Portions of the OCA would be landscaped (revegetated), and PFS would develop landscaping plans with the BIA and the Skull Valley Band.

Construction plans. Construction of the proposed PFSF would occur in three phases. Phase 1 (approximately 18 months) would include construction of the major buildings, one-fourth of the total number of proposed storage pads (i.e., those in the southeastern quadrant of the restricted-access area), the access road, a new rail siding and new rail line. The objective of Phase 1 is to provide an operational facility with a portion of the storage pads completed in time to meet the immediate needs of the power reactor companies that would be shipping SNF. The anticipated workforce requirements are shown in Table 2.1. Phase 1 would require a peak work force of up to 255 workers, including

[1]For the purpose of this FEIS, OCA is defined as the property to be leased by PFS from the Skull Valley Band.

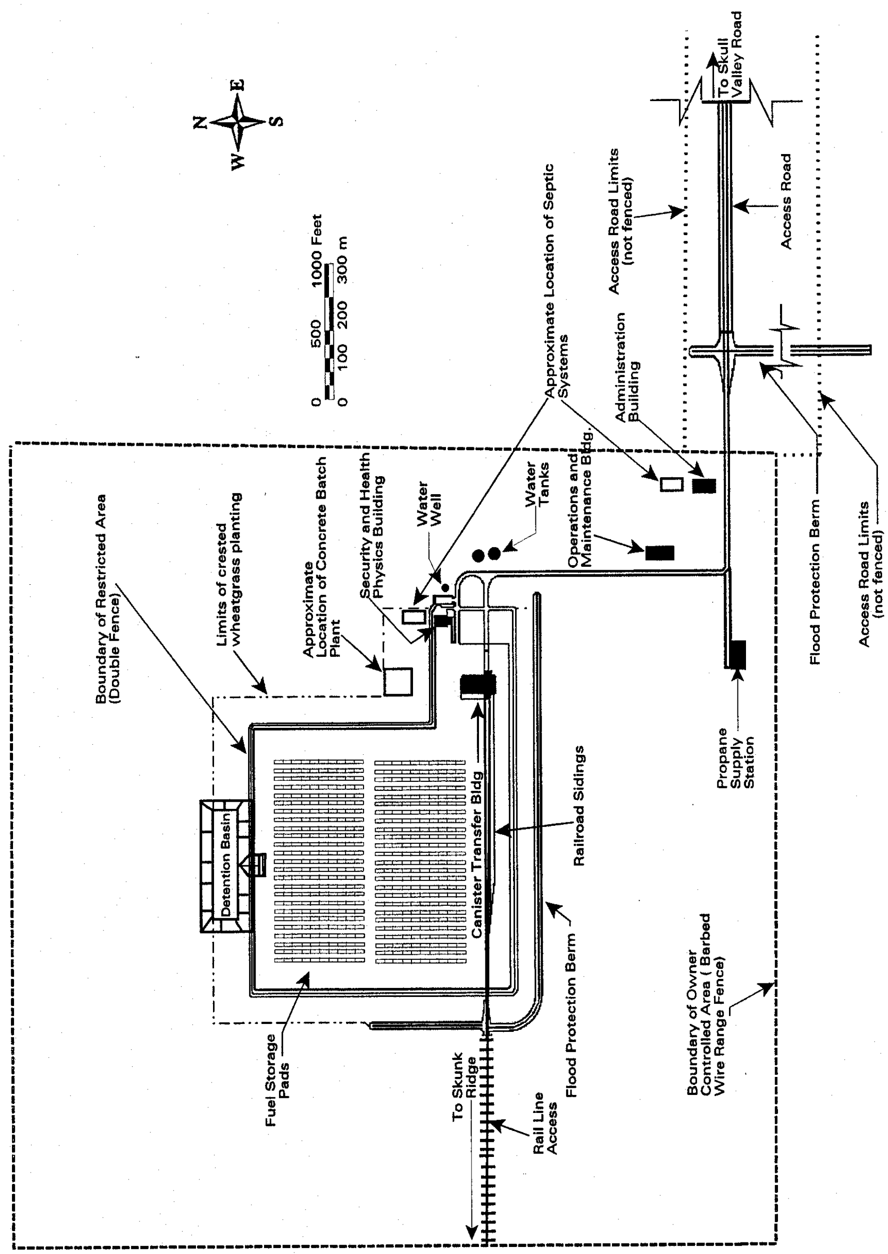

Figure 2.2. Basic site plan and layout of structures and facilities at the proposed PFSF.

Table 2.1. Anticipated peak workforce requirements at the proposed PFSF and new rail corridor

	Construction workers (Phase 1)	Workers during operations (includes Phase 2 and 3 construction)
PFSF	130	43
Rail line	125	2
Total	255	45

130 workers at the Reservation site and as many as 125 additional workers for the new facilities that would connect with the existing Union Pacific rail line (see Section 2.1.1.3). Phase 1 would be completed in about 18 months. Approximately 66 ha (164 acres) of Reservation land would be affected during construction.

Phase 2 would include construction of storage pads in the southwestern quadrant of the restricted-access area, and Phase 3 would include construction of the remaining storage pads (the two northern quadrants). The timing for initiating Phases 2 and 3 would depend on the anticipated needs of the power reactor companies for additional SNF storage capacity. PFS currently estimates the duration of both Phase 2 and Phase 3 construction to be 5 years. The construction work force for Phases 2 and 3 activities is estimated to be about 43 workers.

Storage casks would be constructed on an as-needed basis during Phases 2 and 3 of the facility's construction. As shown in Figure 2.2, a concrete batch plant would be located to the east of the restricted-access area throughout the lifetime of the proposed PFSF to provide concrete for construction of the facilities and the storage casks. The footprint of this batch plant would encompass approximately 0.8 ha (2 acres) and would be sized for a maximum capacity of 57 m^3 (75 yd^3) per hour.

Tables 2.2a, 2.2b, and 2.2c describe the types and quantities of construction materials to be used during the construction of the proposed PFSF project. PFS plans to obtain materials from private, commercial sources in and around Skull Valley and the Tooele area (PFS/ER 2001). While it would be premature to attempt an identification of the likely sources of construction materials for the proposed action, PFS has conducted a study/survey of possible sources of aggregate that could be used for construction of railroad beds, roads, base for building foundations, and aggregate for concrete (see Section 3.1.4).

Storage pads and casks. When fully completed, the proposed PFSF would contain modular concrete storage pads that would be 20 × 9 × 1 m (67 × 30 × 3 ft) as shown in Figure 2.3. Each storage pad would be constructed flush with grade level and would hold up to eight storage casks in a 2 × 4 array. [Modular concrete storage pad design provides for ease of construction by limiting the number of concrete pad construction joints and/or expansion joints required and allows for staged construction of the proposed PFSF (PFS/SAR 2001)]. Five hundred such pads would be arranged as shown in Figure 2.2, resulting in a total capacity for the facility of 4,000 storage casks. Areas between the storage pads would be surfaced with a 20-cm (8-inch) thickness of compacted crushed rock and sloped toward the north to facilitate drainage.

Table 2.2a. Materials to be imported and used in the construction of the proposed PFSF and the Skunk Ridge rail line

	PFSF construction (includes storage pads, but not storage casks)				
Material type	Phase 1 (approx. 18 months)	Phase 2 (approx. 5 years)	Phase 3 (approx. 5 years)	**Construction of rail access corridor from Skunk Ridge**	**Total material required**
Cement	22,000 m^3 (28,800 yd^3)	14,400 m^3 (18,900 yd^3)	21,700 m^3 (28,400 yd^3)	N/A	58,100 m^3 (76,100 yd^3)
Concrete aggregate:					
Small (sand)	16,000 m^3 (21,000 yd^3)	7,800 m^3 (10,200 yd^3)	16,200 m^3 (21,200 yd^3)	N/A	40,000 m^3 (52,400 yd^3)
Large (crushed rock)	12,400 m^3 (16,300 yd^3)	6,200 m^3 (8,100 yd^3)	12,800 m^3 (16,800 yd^3)	N/A	31,400 m^3 (41,200 yd^3)
Total concrete aggregate	28,400 m^3 (37,300 yd^3)	14,000 m^3 (18,300 yd^3)	29,000 m^3 (38,000 yd^3)	N/A	71,400 m^3 (93,600 yd^3)
Crushed rock:					
Access road base	24,800 m^3 (32,500 yd^3)	N/A	N/A	N/A	24,800 m^3 (32,500 yd^3)
Storage area grading (plus buildings area grading for Phase 1)	32,000 m^3 (42,000 yd^3)	11,800 m^3 (15,500 yd^3)	25,600 m^3 (33,500 yd^3)	N/A	69,400 m^3 (91,000 yd^3)
Rip-Rap	8,500 m^3 (11,100 yd^3)	N/A	N/A	N/A	8,500 m^3 (11,100 yd^3)
Total crushed rock	65,300 m^3 (85,600 yd^3)	11,800 m^3 (15,500 yd^3)	25,600 m^3 (33,500 yd^3)	N/A	102,700 m^3 (134,600 yd^3)
Sub-ballast	N/A	N/A	N/A	172,000 m^3 (225,000 yd^3)	172,000 m^3 (225,000 yd^3)
Ballast	N/A	N/A	N/A	73,000 m^3 (95,700 yd^3)	73,000 m^3 (95,700 yd^3)
Asphalt paving	7,300 m^3 (9,600 yd^3)	N/A	N/A	N/A	7,300 m^3 (9,600 yd^3)

Table 2.2b. Materials to be imported and used in the construction of SNF storage casks at the proposed PFSF

Material type	SNF storage casks manufactured during PFSF construction			SNF storage casks manufactured during remainder of 20-year life of PFSF	Total material required
	Phase 1 (approx. 18 months; no casks constructed)	Phase 2 (1000 casks over approx. 5 years)	Phase 3 (1000 casks over approx. 5 years)	(2000 casks over approx. 10 years)	
Cement	N/A	6,000 m^3 (7,850 yd^3)	6,000 m^3 (7,850 yd^3)	12,000 m^3 (15,700 yd^3)	24,000 m^3 (31,400 yd^3)
Concrete aggregate:					
Small (sand)	N/A	12,000 m^3 (15,650 yd^3)	12,000 m^3 (15,650 yd^3)	23,900 m^3 (31,300 yd^3)	47,900 m^3 (62,600 yd^3)
Large (crushed rock)	N/A	18,000 m^3 (23,500 yd^3)	18,000 m^3 (23,500 yd^3)	35,900 m^3 (47,000 yd^3)	71,900 m^3 (94,000 yd^3)
Total concrete aggregate	N/A	30,000 m^3 (39,150 yd^3)	30,000 m^3 (39,150 yd^3)	59,800 m^3 (78,300 yd^3)	119,800 m^3 (156,600 yd^3)

N/A = This type of material is not required for the indicated phase of construction.

Source: PFS/ER 2001; Sections 4.1.7.1 through 4.1.7.3. Material requirements are based on assumed finished concrete volume that is equivalent to one part cement, two parts sand, and three parts crushed rock. No credit was taken for volumetric expansion.

Table 2.2c. Total amounts of cement and concrete aggregate to be imported and used in the construction of the proposed PFSF and the SNF storage casks

	PFSF construction plus storage cask construction				
Material type	Phase 1 (approx. 18 months)	Phase 2 (approx. 5 years)	Phase 3 (approx. 5 years)	**SNF storage casks manufactured during remainder of 20-year life of PFSF**	**Total material required**
Cement	22,000 m^3 (28,800 yd^3)	20,400 m^3 (26,750 yd^3)	27,700 m^3 (36,250 yd^3)	12,000 m^3 (15,700 yd^3)	82,100 m^3 (107,500 yd^3)
Concrete aggregate:					
Small (sand)	16,000 m^3 (21,000 yd^3)	19,800 m^3 (25,850 yd^3)	28,200 m^3 (36,850 yd^3)	23,900 m^3 (31,300 yd^3)	87,900 m^3 (115,000 yd^3)
Large (crushed rock)	12,400 m^3 (16,300 yd^3)	24,200 m^3 (31,600 yd^3)	30,800 m^3 (40,300 yd^3)	35,900 m^3 (47,000 yd^3)	103,300 m^3 (135,200 yd^3)
Total concrete aggregate	28,400 m^3 (37,300 yd^3)	44,000 m^3 (57,450 yd^3)	59,000 m^3 (77,150 yd^3)	59,800 m^3 (78,300 yd^3)	191,200 m^3 (250,200 yd^3)

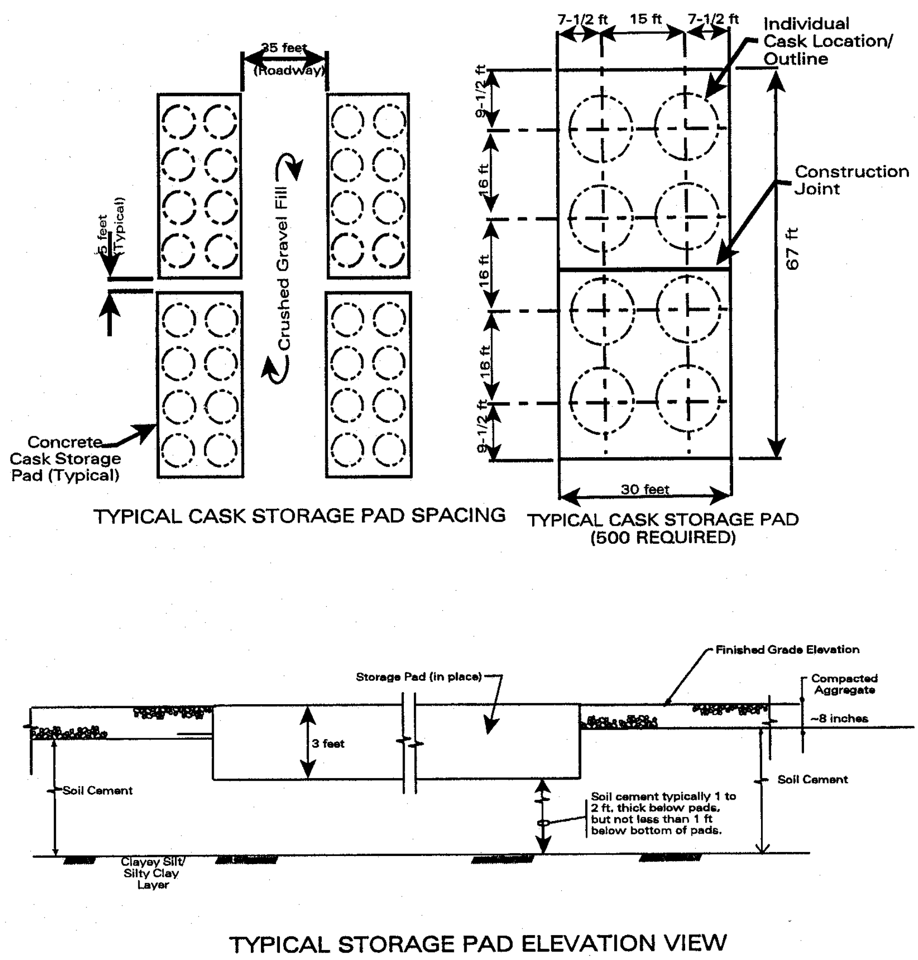

Figure 2.3. Storage pad detail. Note: 1 ft = 0.3048 m

As described in greater detail in Section 2.1.2.2, the storage casks would be cylindrically shaped concrete and steel structures, approximately 3.4 m (11.0 ft) in diameter and 6.1 m (20.0 ft) high. The steel liners of the casks would be manufactured off-site and transported to the proposed PFSF. The storage casks would be assembled on-site using concrete from the on-site batch plant and the steel liners supplied by the cask vendor. The casks would be assembled at the batch plant on an as-needed basis.

Principal buildings. In addition to the storage pads described above, there would be four buildings that would be constructed as part of the proposed PFSF (see Figure 2.2): the Canister Transfer Building, the Security and Health Physics Building, the Operations and Maintenance Building, and an Administration Building. Each of these structures would be designed according to its intended function. The function of each building is described in the paragraphs below.

The Canister Transfer Building (see Figure 2.2) would be a massive, reinforced-concrete, high-bay structure approximately 60-m (200-ft) wide, 80-m (260-ft) long, and 27-m (90-ft) high. This building would facilitate the transfer of the SNF canister from its shipping cask into the storage cask. To support the operations described in detail in Section 2.1.2.2, the Canister Transfer Building would be equipped with a 180-metric-ton (200-ton) overhead bridge crane for moving the shipping casks, a 135-metric-ton (150-ton) semi-gantry crane for canister transfer operations, and three canister transfer cells to provide a radiation-shielded work space for transferring the SNF canisters from the shipping casks to the storage casks. Shipping casks would be moved into the high bay portion of the building either on railcars or heavy/haul trailers, depending on which transportation option is chosen.

The Security and Health Physics Building would be the entrance point for the 40-ha (99-acre) restricted-access area. The building would be located adjacent to the Canister Transfer Building and would consist of a single-story, concrete masonry structure approximately 23 m (76 ft) wide, 37 m (120 ft) long, and 5.5 m (18 ft) high. This building would provide office and laboratory space for security and health physics staff and would house security, communication, and electrical equipment needed for these personnel.

Both the Administration Building and the Operations and Maintenance Building would be located outside the restricted-access area. The Administration Building would consist of a single story, steel frame building approximately 24 m (80 ft) wide, 46 m (150 ft) long, and 5 m (17 ft) high, and would include office and records management space, an emergency response center, meeting rooms, and a cafeteria. The Operations and Maintenance Building would consist of a single story, steel frame building approximately 24 m (80 ft) wide, 61 m (200 ft) long, and 8 m (26 ft) high. This building would house maintenance shops and storage areas for spare parts and equipment to service vehicles and equipment at the facility.

Paved parking areas would be constructed adjacent to the Administration Building, the Operations and Maintenance Building, and the Security and Health Physics Building. The paved area at the Administration Building would cover 0.3 ha (0.8 acres). The paved area at the Operations and Maintenance Building would occupy 1 ha (2.5 acres), including a 0.2-ha (0.5-acre) asphalt lay down area. The paved area at the Security and Health Physics Building would cover 0.08 ha (0.2 acre).

Foundations and footings. Field investigations indicate that the soils underlying a silty layer at the surface of the proposed PFSF site are suitable for supporting the proposed structures; therefore, no special construction techniques would be required for improving the subsurface conditions below this silt layer. The silt layer, in its *in situ* loose state, is not a suitable foundation for the proposed storage pads, and improvements would be required to enhance the strength of this silt layer. The silt layer would be removed from the storage pad area and from around the foundation area for the Canister Transfer Building and would be replaced with a soil-cement mixture. The silt excavated from the storage pad emplacement area would be mixed with sufficient portland cement and water and compacted to form a strong soil-cement subgrade to support the cask storage pads. The footings and foundation for the Canister Transfer Building would be founded on the clayey layer beneath the silt layer and would be surrounded by a soil-cement mat. The required characteristics of the soil-cement would be engineered during detailed design to meet the necessary strength requirements.

Using soil-cement to stabilize the silt layer would reduce the amount of spoil materials generated, would create a stable and level base for storage pad construction, and would substantially improve the sliding resistance of the storage pads. The soil-cement would also be used to replace the compacted structural fill that was included in the original plan between the rows of pads, thus reducing the number of truck trips that would be required to import fill material.

Access road, flood protection structures, and erosion control structures. An 82-ha (202-acre) right-of-way between the leased 330-ha (820-acre) site and Skull Valley Road would contain an access road to the proposed facility and overhead power and telephone lines. Construction of the road would require clearing an area of about 9 ha (22 acres). During initial construction, the access road would be built with a gravel surface and paved with asphalt at the end of major Phase 1 site earthwork. The road would consist of two 4.5-m (15-ft) lanes. Parking areas around the Administration Building, Security and Health Physics Building, and the Operation and Maintenance Building would be surfaced with asphalt or concrete. PFS plans to obtain asphalt for paving the access road and parking lots from existing asphalt plants in the area (PFS/ER 2001).

An earthen diversion berm would be built (from materials removed from the storage pad area) around the uphill sides of the storage area (i.e., along the south and west sides, as shown in Figure 2.2) to protect the site from PMF events by diverting storm runoff away from the storage pads and into the natural drainage basin located to the north. (The rail line access would be constructed to pass over the berm.) This L-shaped berm would be about 15 m (50 ft) wide, 1,310 m (4,300 ft) long, and 1.5 m (5 ft) high. The top of this berm would be at an elevation of 1,365 m (4,480 ft) above sea level. The earthen berm would be covered with riprap (i.e., loosely assembled, large pieces of broken or crushed stone) to resist wind erosion, as well as water erosion from runoff during storms.

A second, separate earthen berm would be built (from materials removed from the storage pad area) perpendicular to the access road about 230 m (750 ft) east of the site boundary (see Figure 2.2), but within the access road right-of-way, to divert flood runoff originating from the Stansbury Mountains. The access road would pass over the berm. This berm would span a local topographical low between existing ridges and would be about 19.5 m (64 ft) wide, 580 m (1,900 ft) long, and a maximum of 2.7 m (9 ft) high. The top of this berm would be at an elevation of 1,374 m (4,507.5 ft) above sea level, and it too would be covered with riprap. Specific details regarding the design and construction of the berms are given in the SAR and the NRC's SER, as updated. These reports address safety issues associated with potential flooding at the proposed facility.

On-site drainage at the storage pad area would be conveyed by a surface flow system to a 3-ha (8-acre) stormwater collection and detention basin to be located at the northern boundary of the restricted-access area (see Figure 2.2). Water collected in this detention basin would be allowed to either evaporate or percolate into the ground. The detention basin would be 245 m (800 ft) wide and 60 m (200 ft) long, and 3 m (10 ft) deep. The basin would be designed for a 100-year storm event.

Water drainage from the storage site as a result of a typical rainstorm is expected to soak into the ground before it reaches the detention basin. In the event of excessive rainfall or snowmelt that results in standing water in the detention basin, PFS has committed to pumping out the collected water. The basin would be constructed with compacted soil and would have side slopes of 10 to 1. The gradual side slopes would reduce the velocity of the rain water flowing into the basin, thereby reducing the potential for wind or water erosion. The sides and bottom of the detention basin would be planted with crested wheatgrass to provide additional stabilization.

Utilities and other services. Lighting would be designed for the security, monitoring, and surveillance of the storage casks. Lighting for the 40-ha (99-acre) restricted-access area would be provided by lights atop 40-m (130-ft) poles located at the perimeter of the area. The light fixtures would be downcast and shielded to minimize light pollution.

Electrical power for lighting, the security system, equipment operation, and other general purposes would be obtained from a new transformer that would be connected with new lines on standard poles to the existing 12.5-kV distribution line that runs along Skull Valley Road. Backup power for the security system, emergency lighting, and the site public address system would be provided by a diesel generator located in the Security and Health Physics Building. The communication system would consist of telephones, a public address system, and short-wave radio equipment.

All the buildings at the proposed PFSF would be heated with propane. Additional electric baseboard heaters could be used in the offices located in the Canister Transfer Building. A group of four propane tanks would be located at a minimum distance of 550 m (1,800 ft) from the Canister Transfer Building and the cask storage area. Each propane tank would hold up to 19 m^3 (5,000 gal).

A potable water supply system would be provided for the facility, taking water from either a groundwater well on the site or off-site sources. Because it is unlikely that a well drilled into the mid-valley aquifer would yield adequate quantities of water on demand, above-ground storage tanks would be erected for potable water, water for use in extinguishing fire, and water for the concrete batch plant. The water tanks would likely be located outside the restricted-access area between the concrete batch plant and the restricted-access area fence. A fire suppression system in the Canister Transfer Building would be fed by fire pumps and by a primary and a backup water tank [each with a capacity of 380 m^3 (100,000 gal)] to be located outside the restricted-access area.

Water requirements at the proposed PFSF would be similar to a light industrial facility having a 24-hr per day workforce, with the greatest water use being during construction for dust suppression and operation of the concrete batch plant. Projected water usage is shown in Table 2.3. Maximum daily water use for construction of the proposed PFSF would occur at the beginning of Phases 1, 2, and 3 of the construction schedule and would require as much as 524 m^3/day (138,300 gal/day) of which 511 m^3/day (135,000 gal/day) would be supplied from private off-site sources and 12 m^3/day (3,300 gal/day) would be supplied from an on-site well. The peak daily water consumption from the on-site well during construction would occur during Phase 1 and would be 38 m^3/day (10,000 gal/day). Over the entire construction and operational lifetime of the proposed PFSF, the average water withdrawal rate from the well would be about 11 m^3/day (2,964 gal/day), 2.1 gpm, or 3.3 acre-ft/year.

Table 2.3. Summary of water requirements during construction of the proposed PFSF

Phase of construction	Construction period	Estimated total water use[a] [m^3/day (gal/day)]	Estimated water use from on-site wells [m^3/day (gal/day)]
Phase 1 (18-months)	Period 1; first 6 weeks	524 (138,300)	12 (3,300)
	Period 1; following 2 weeks	223 (58,800)	12 (3,300)
	Period 2; first 5 months	248 (65,500)	38 (10,000)
	Period 2; following 2 months	182 (48,200)	38 (10,000)
	Period 3; first 2 months	168 (44,500)	21 (5,600)
	Period 3; following 7 months	103 (27,200)	21 (5,600)
Phase 2 (5 years)	Period 1; first 6 weeks	449 (118,600)	17 (4,400)
	Period 2; following 5-year period	27 (7,100)	17 (4,400)
Phase 3 (5 years)	Period 1; first 12 weeks	358 (94,600)	20 (5,400)
	Period 2; following 5-year period	34 (8,900)	20 (5,400)

[a]Usage includes water for soil compaction, soil cement, dust control, concrete, and worker consumption.

Construction of the new rail line from Skunk Ridge would require a daily water use of 624 m^3/day (165,000 gal/day), which would primarily be used for soil compaction and wetting of haul roads to minimize dust emissions. Additional water would be required for making concrete for culverts on the rail line. The quantity of water required for making this concrete is minimal in terms of the project requirements. Water could also be required during the proposed revegetation of the site and the rail corridor; however, estimated quantities will be available only upon finalization of the revegetation plan prior to construction. The amounts of water that could be needed during revegetation would be small with respect to the total water requirements of the proposed project. Water for worker use and for concrete could be obtained from new on-site wells; the remaining water, suitable for construction uses, would be obtained from off-site sources. In the event that on-site water quality or quantity is inadequate, potable water would be obtained directly from the Reservation’s existing water supply, or additional water well(s) would be drilled east of the site, outside the OCA, but still within the Reservation boundaries. If such additional wells are needed on the Reservation, they would need to be approved by BIA and could be subject to a separate environmental review under NEPA. Alternative or additional sources of water are available from private sources within 24 km (15 miles) of the proposed rail siding at Skunk Ridge (PFS/ER 2001).

A sanitary drainage system, using underground pipes, would be installed to serve the proposed buildings and to transmit liquid wastes to underground septic systems. Drain sumps (see Section 2.1.3) would be provided in the Canister Transfer Building. Two separate septic tank and drain-field systems would be constructed to collect and process the waste water from the sanitary drainage system. One system would be constructed near the Security and Health Physics Building to serve the storage portion of the proposed PFSF, and another system would be constructed near the Administration Building to serve the balance of the proposed PFSF. The underground septic system would require clearing a total area of about 0.8 ha (2 acres). The two septic systems, each with a capacity to serve approximately 20 people, would be expected to process less than 19 m^3/day (5,000 gal/day). The size of the systems requires an Underground Injection Control registration with EPA.

A 4-m^3 (1,000-gal) aboveground diesel fuel oil storage tank would be located inside the restricted-access area adjacent to the Security and Health Physics Building and would supply fuel for the cask transporter to be used in moving the storage casks onto the storage pads. This tank would be supplied with fuel from a regional bulk fueling service. No on-site locomotive fuel storage would be provided. The locomotives would be refueled off-site by tanker trucks provided by a regional bulk fueling service.

2.1.1.3 New Rail Line

PFS has proposed to transport SNF from the existing Union Pacific rail line at the north end of Skull Valley to the proposed PFSF by rail. PFS's proposed option is to build a new rail line to the site from the existing, main rail line at Skunk Ridge (near Low, Utah), southward along the west side of Skull Valley and then eastward across the valley to the site (see Figure 1.2).

Currently, there is no existing rail service to the Reservation. The nearest rail line is the Union Pacific Railroad approximately 39 km (24 miles) to the north (see Figure 1.2). PFS proposes to construct a new rail siding to connect to the existing Union Pacific main line at Skunk Ridge, near Low, Utah, and a new rail line that would run to the proposed PFSF site through public lands administered by the BLM on the eastern side of the Cedar Mountains. The descriptions below are taken from PFS's right-of-way application and Plan of Development for the new rail line (Donnell 1999; Hennessy 1999).

Construction of the new rail line is expected to last about 14 months and would occur simultaneous with the construction of the PFSF on the Reservation. The proposed rail line would be designed, constructed, operated, and maintained in accordance with Federal Rail Administration requirements for Class 3 track. A peak workforce of 125 workers would be needed during the construction period, primarily for earthwork. The types of equipment to be used include bulldozers, scrapers, dump trucks, front-end loaders, compactors, graders, and water trucks. Other work activities would be associated with laying the sub-ballast and ballast (i.e., the foundation and bed) for the track, and laying the track.

The proposed right-of-way for the rail line would be approximately 51 km (32 miles) long and 60 m (200 ft) wide. An additional "temporary use area" of 15 m (50 ft) on each side of the 60-m (200-ft) permanent right-of-way would also be needed for topsoil stockpiles and other construction uses. These additional use areas would be needed only until the end of the 14-month construction period.

For the construction of the rail line, approximately 314 ha (776 acres) within the proposed 60-m (200-ft) right-of-way would be cleared. This does not include any clearing within the 15-m (50-ft) "temporary use area" on both sides of the right-of-way because PFS has proposed only limited and minor uses of this area. About 63 ha (155 acres) of the right-of-way would be disturbed for the life of the project. Approximately 251 ha (621 acres) of the right-of-way would be revegetated after construction of the rail line has been completed. Clearing of the right-of-way would involve the removal and disposal of vegetation along the 12-m (40-ft) wide rail bed, at cut and fill areas, and at soil stockpile locations within the temporary use areas. Woody vegetation would be shredded and scattered in place. Ravines and other features would be reestablished after construction.

A new rail siding would be constructed at Skunk Ridge within the proposed 60-m (200-ft) right-of-way and would consist of two single tracks spaced 4.5 m (15 ft) apart and parallel to the proposed new rail line (see Figure 2.4). The total length of the new siding would be about 760 m (2,500 ft). Other than the new track, no new structures would be constructed at the proposed Skunk Ridge rail siding.

Other than an unimproved road, there is no existing access from the Low interchange of Interstate 80 to the site of the proposed rail siding. The unimproved road consists of unmaintained portions of the former U.S. Highway 40. PFS proposes to use the area at the Low interchange to unload construction vehicles and to move them to the construction site by using the existing unimproved road. The existing Union Pacific main line passes beneath Interstate 80 at 6 to 9 m (20 to 30 ft) below grade level near the location of the proposed new siding. The new siding would require extensive excavation to connect the new rail line to the existing main line just south of the interstate. Approximately 200,000 m^3 (261,000 yd^3) of material would have to be removed. This material would be expected to serve as fill material for the northern portion of the proposed new rail line near the new siding.

The bed for the new rail line would be approximately 12 m (40 ft) wide. The rail bed would be composed of a standard 4-ft, 8.5-in gauge single track, a 5-m (17-ft) wide layer of ballast material, a 10-m (34-ft) wide layer of sub-ballast material, and a 1-m (3-ft) wide cleared area on each side of the sub-ballast (see Figure 2.5).

Any of the remaining right-of-way which is disturbed during construction would be revegetated using the native seed mix recommended by the BLM. The top of the completed rail line would be approximately 1.4 m (4.5 ft) above the surrounding terrain.

The ballast and sub-ballast for the new rail line would be composed of crushed gravel or rock and would be obtained from an existing commercial gravel pit in the area. Approximately 172,000 m^3 (225,000 yd^3) of sub-ballast and 73,000 m^3 (95,700 yd^3) of ballast would be needed.

The proposed rail alignment crosses relatively flat terrain. Except for the area near the proposed siding, which would require excavation as described above, relatively few cuts and fills would be necessary. An attempt would be made to balance the expected volume of cuts and fills to minimize the need for additional fill material. It is estimated that the total amount of cut material would be about 676,000 m^3 (884,000 yd^3) [including the 200,000 m^3 (261,000 yd^3) near the new rail siding, as discussed above]. The total amount of fill material expected to be needed would be about 480,000 m^3 (628,000 yd^3); thus, a surplus of material would be generated [about 196,000 m^3 (256,000 yd^3)]. PFS has indicated that all excess material would be used as embankment dressing, however, the amounts of estimated cut and fill material will be revised and refined in the future to ensure this is possible. In any event, BLM would require that any excess material not used for embankment dressing or other useful purposes be removed from the right-of-way.

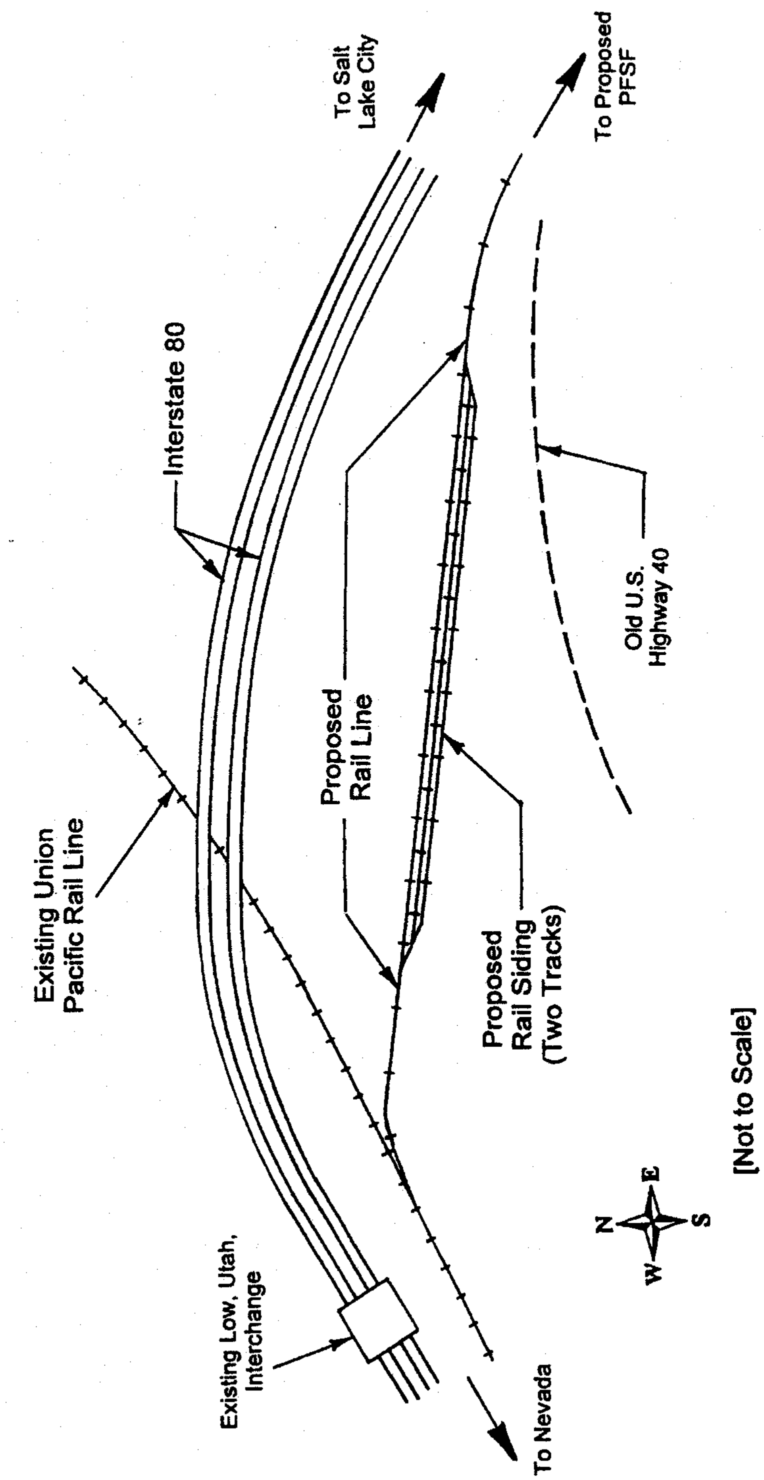

Figure 2.4. Basic site plan and layout for the proposed rail siding near Skunk Ridge, Utah.

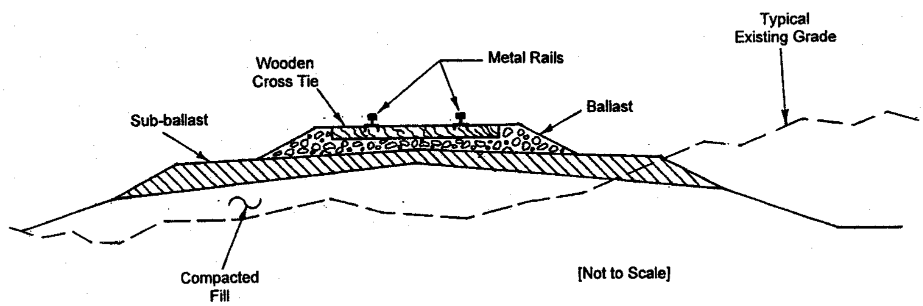

Figure 2.5. Typical cross-section for proposed new rail corridor.

The rail line would cross 32 arroyos (i.e., gullies or gulches cut by ephemeral streams) at which drainage culverts designed to the 100-year flood would be installed. The rail line would cross two improved gravel roads, as well as seven dirt roads and/or four-wheel-drive vehicle trails. At-grade crossings would be constructed so as not to impair travel on these roads and trails. The trains using the proposed new rail line would be limited to speeds of 32 km/hr (20 mph), and travel on the crossroads is extremely light; therefore, there would be no installation of such devices as lights or barriers. A standard, cross-buck railroad crossing sign would be erected at each grade crossing.

The rail line would not be fenced, and no access road along the rail line would be provided. Access for maintenance purposes would be accomplished by existing roads in the area and by railroad (i.e., hi-rail) vehicles moving along the track.

2.1.1.4 Land Use Requirements

Table 2.4 summarizes the amount of land potentially disturbed by the proposed activities to construct the proposed PFSF, the new access road to the proposed PFSF, and the new rail siding and new rail line. Land areas that would be disturbed at the location of the proposed PFSF and its access road would be on the Reservation, under the jurisdiction of the Skull Valley Band. (Title to the land is held by the United States in trust for the Band.) Land areas to be disturbed at the new rail siding would be managed by the BLM. In addition, the BLM manages the land that would be used for the new rail line between Skunk Ridge and the proposed PFSF.

Table 2.4 shows the amounts of land that would be cleared and revegetated after construction, as well as the amounts of land that would remain cleared for the life of the project.

Table 2.4. Potential land areas involved in construction of the proposed facility and the associated rail corridor

Facility/component	Hectares (acres) to be cleared	Hectares (acres) to be revegetated after construction	Hectares (acres) to remain cleared for life of project
Main facility[a] and access road[b] from Skull Valley Road	94 (232)	37 (92)[c]	57 (140)
New 51-km (32-mile) rail line[d] from Skunk Ridge to proposed PFSF on the Reservation	314 (776)	251 (621)	63 (155)

[a]Includes construction within the 40-ha (99-acre) restricted-access area and its fire barrier (crested wheatgrass) and perimeter road/isolation area, the PMF berms, and the storm water detention basin.

[b]Includes construction within the 82-ha (202-acre) right-of-way between the proposed facility and Skull Valley Road.

[c]Includes 100 m (300 ft) fire barrier around the outer edge of the perimeter road around the restricted-access area.

[d]Includes a new rail siding to be constructed within the 60-m (200-ft) right-of-way for the proposed new rail line at Skunk Ridge.

2.1.2 Operation

Construction of the first phase of the proposed PFSF is expected to be completed in 18 months, followed by commercial operations approximately 4 months later. Operation of the proposed PFSF, which would require a workforce of about 43 people, would involve receiving, transferring, and storing the SNF as described in the following subsections.

A general discussion of SNF transportation is provided below to give an overview of the complete operation. In addition to the operations described below for receiving SNF at the proposed PFSF, once DOE develops a permanent repository, operations would include transferring the stored SNF canisters to vendor-supplied, NRC-certified shipping casks and transporting them from Skull Valley to the DOE facility. (Shipping casks—unlike storage casks—would not be manufactured on site.) Shipments away from Skull Valley would be accomplished by reversing the order of operations used for the receipt of SNF at the proposed PFSF in Skull Valley.

2.1.2.1 Transportation of Spent Fuel to the Proposed PFSF

PFS proposes to use a dual-purpose canister system (see the discussion in the dialogue box in this section) to transport the SNF from PFS member companies and possibly other nuclear reactor locations (see Figure 1.3) to the proposed PFSF. The steel canister that contains the SNF is compatible with the HI-STORM 100 storage overpack (i.e. storage cask) to be used at PFS and the HI-STAR 100 transportation overpack (i.e. transportation cask) to be used for shipments between the originating power reactor generating company and PFSF. PFS plans to ship SNF from reactor sites to the proposed PFSF by railcar only. The sequence of operations is illustrated in Figure 2.6 and discussed in the following paragraphs.

At the originating reactor site, multiple SNF assemblies would be loaded into a metal canister, and the canister would be prepared for shipping (see Item Nos. 1 through 3 in Figure 2.6). This preparation includes surveying the canister for contamination, decontaminating as needed, filling the canister with helium, and then welding it shut (see Item Nos. 4 and 5 in Figure 2.6). The canister would then be placed into the Holtec International HI-STAR 100 transportation overpack [a certified shipping cask (see Item No. 6 in Figure 2.6) that is protected by impact limiters] loaded onto a shipping cradle, and then attached horizontally to a railcar for shipment to the proposed PFSF in Skull Valley (see Item No. 7 in Figure 2.6). The proposed shipping casks are made of steel and weigh up to 130 metric tons (150 tons) when loaded with the SNF and the canister. For reactor sites without direct rail access, the shipping cask would be loaded onto a heavy-haul vehicle or barge and transported to a nearby rail line where the cask would be loaded onto a railcar for transport to the proposed PFSF. If a reactor site cannot accommodate the shipping cask proposed by PFS, the reactor licensee would load SNF (in the SNF pool) into smaller "transfer" casks and then, using a dry transfer system, move the fuel from the smaller transfer casks into the larger shipping cask.

Because both the canister and HI-STAR 100 transportation cask will be submerged in the reactor spent fuel pool during loading, the exterior of the transportation cask (excluding impact limiters) and the canister may become contaminated with radionuclides. However, these areas would be decontaminated by the reactor licensee prior to shipment to PSF in accordance with transportation regulations. The HI-STAR 100 transportation cask is leak-tested prior to each shipment and is designed to prevent leakage even if the canister sealed within the cask is contaminated with radioactive material. The HI-STAR 100 transportation cask uses a bolted-lid overpack that is designed to meet all NRC regulatory requirements and prevent leakage of radioactive material beyond allowable levels during transportation. Therefore, any unacceptable release to the environment during transportation to and from the proposed PFSF is precluded.

On average, approximately 150 (100 to 200) loaded shipping casks would be received at the proposed facility each year. Shipments would arrive at Skull Valley via one of the rail routes shown in Figure 2.7. For these shipments, PFS would use either of two, single-purpose, dedicated trains which would proceed from the originating reactor site directly to Skull Valley, Utah, stopping only for crew changes, refueling, and periodic inspections. If the proposed rail line to the facility is constructed, then on average, the proposed PFSF would receive one (or up to two) trains each week carrying two to four loaded shipping casks per train; however, up to six loaded shipping casks per train could be accommodated by the proposed single-purpose trains. PFS has committed to complying with the Association of American Railroads' (AAR's) "Performance Standard for Spent Nuclear Fuel Trains."

Transport to the proposed PFSF from the main line of the Union Pacific rail system would be done by rail using the proposed Skunk Ridge rail line described in Section 2.1.1.3. A minimum of two fleets of three to six railcars each would be used under the rail option. Shipping casks would not be removed from the railcars when they reach the proposed Skunk Ridge siding. Rather, the railcars containing shipping casks would be moved by locomotives along the new rail line to the proposed PFSF. Generally, one (or possibly two) such round-trips would be scheduled each week. Two personnel would be required to operate the locomotives and perform the necessary coupling and uncoupling operations at the new rail siding.

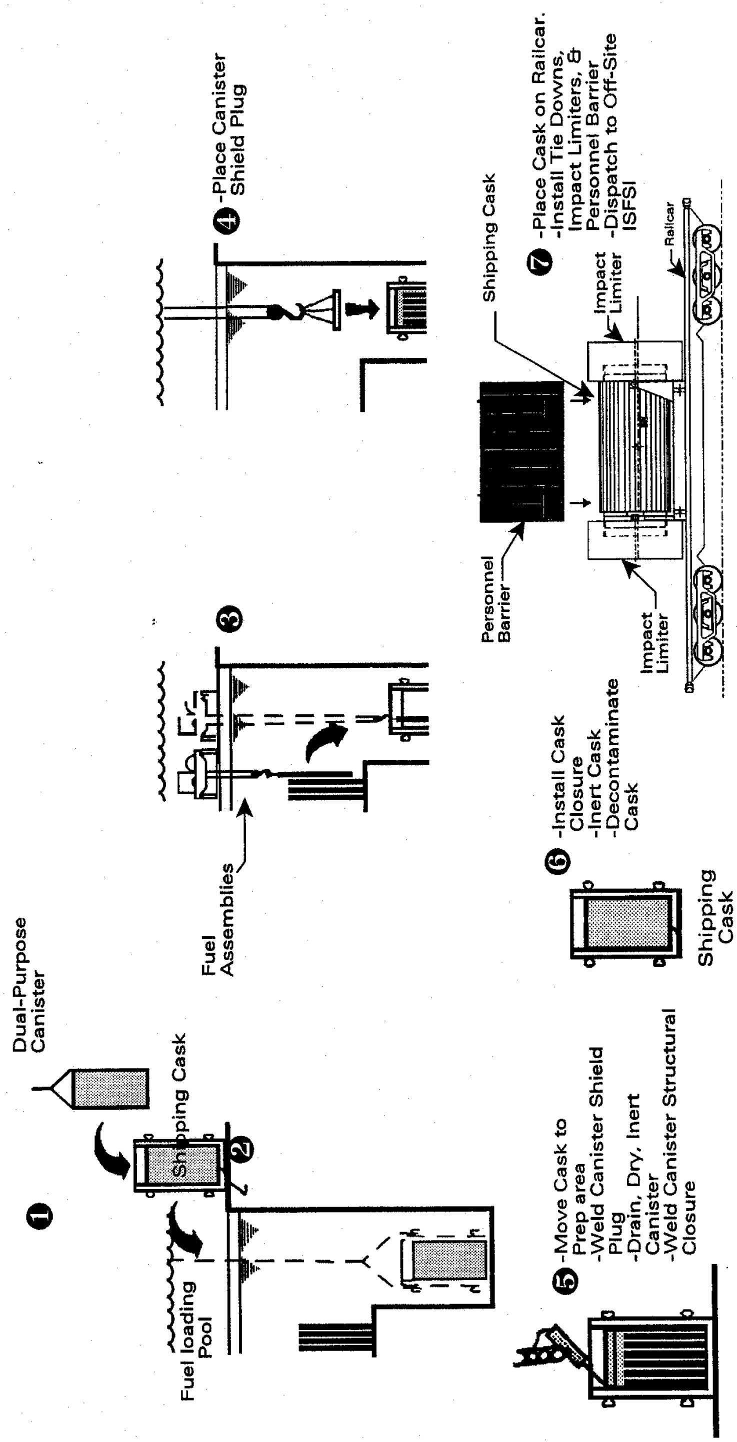

Figure 2.6. Sequences of canister handling and transfer operations for the movement of spent nuclear fuel at existing reactor sites.

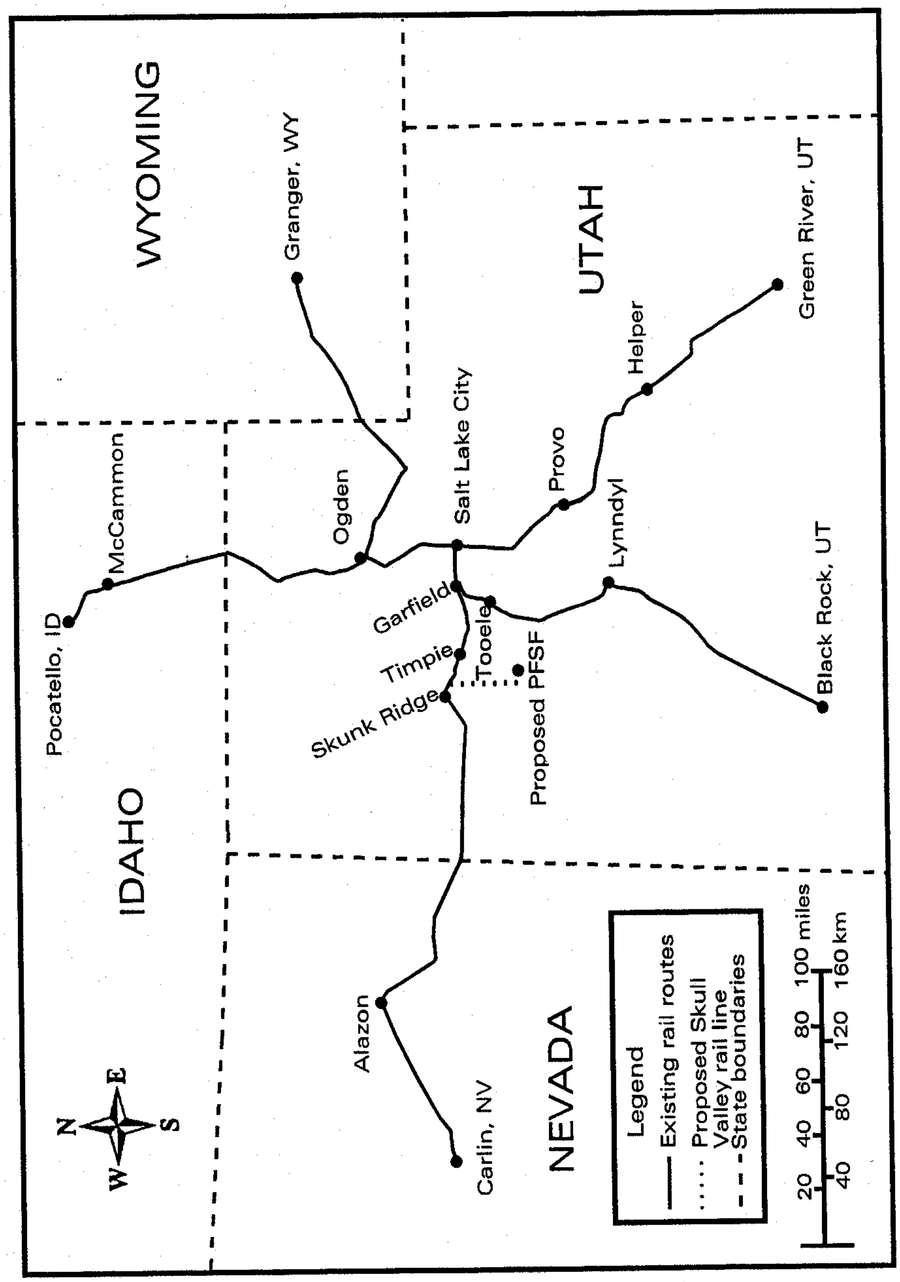

Figure 2.7. Potential rail routes for shipping spent nuclear fuel to Skull Valley, Utah.

PFS would employ a "start-clean/stay-clean" philosophy, meaning that the proposed PFSF would be intended to be a radiological contamination-free site. Operating under the start-clean/stay-clean philosophy, PFS would require that once a railcar arrives at the PFSF site, the shipping cask, impact limiters, and shipping cradle would be visually inspected. Personnel would then transfer the shipping cask into a designated area for radiological monitoring.

After the receipt is complete, the railcars carrying the shipping casks would be pushed by locomotive into the Canister Transfer Building, where the shipping casks would be removed from their railcars by crane (see Item No. 1 in Figure 2.8), turned to a vertical position, and moved into a transfer cell (see Item No. 2 in Figure 2.8). Inside the transfer cell, the shipping cask and the storage cask would sit side by side (see Figure 2.8). The top of the shipping cask would be unbolted, removed, and set aside. Once the lid of the shipping cask is removed, the canister is surveyed for radiological contamination to assure it meets PFSF acceptance levels. In the unlikely event the canister is found to be contaminated above acceptable levels, PFS intends to close the lid of the HI-STAR 100 transportation overpack (i.e., shipping cask) and return it to the originating reactor site. As stated above, the HI-STAR 100 transportation cask uses a bolted-lid overpack that is designed to meet all NRC regulatory requirements and prevent leakage of radioactive material beyond allowable levels during transportation.

In accordance with NRC and DOT regulations, the HI-STAR 100 transportation cask will be surveyed prior to transport from the proposed PFSF to assure that all transportation standards, including radiological contamination and dose limits, are satisfied. The transportation cask can only be shipped if it satisfies all appropriate NRC and DOT regulations. If necessary, PFS will decontaminate the exterior of the transportation cask to levels below regulatory limits prior to shipment back to the originating reactor for future use. However, the exterior of the HI-STAR 100 transportation cask is unlikely to be contaminated because the cask is decontaminated at the reactor site prior to its shipment to the proposed PFSF and it should not be exposed to any external radioactive material during shipment or transfer at the proposed PFSF.

If the canister meets acceptable contamination levels, the single failure-proof crane would then pick up an open-bottomed, shielded transfer cask and move it into position over the shipping cask. The sealed SNF canister would be lifted out of its shipping cask into the transfer cask. The crane would be used to move the transfer cask (with the SNF canister inside) from the top of the shipping cask to the top of the storage cask (see Item No. 3 in Figure 2.8).

Once the transfer cask is in position above the storage cask, the canister would then be lowered from the transfer cask into the storage cask (see Item No. 4 in Figure 2.8). A lid would be placed and bolted on top of the storage cask prior to moving the cask onto a storage pad (see Item No. 5 in Figure 2.8).

A specially designed storage cask transporter, equipped with a 180-metric-ton (200-ton) hydraulic lifting beam and rolling tracks (see Figure 2.9), would be used to move each storage cask from the Canister Transfer Building onto the storage pads.

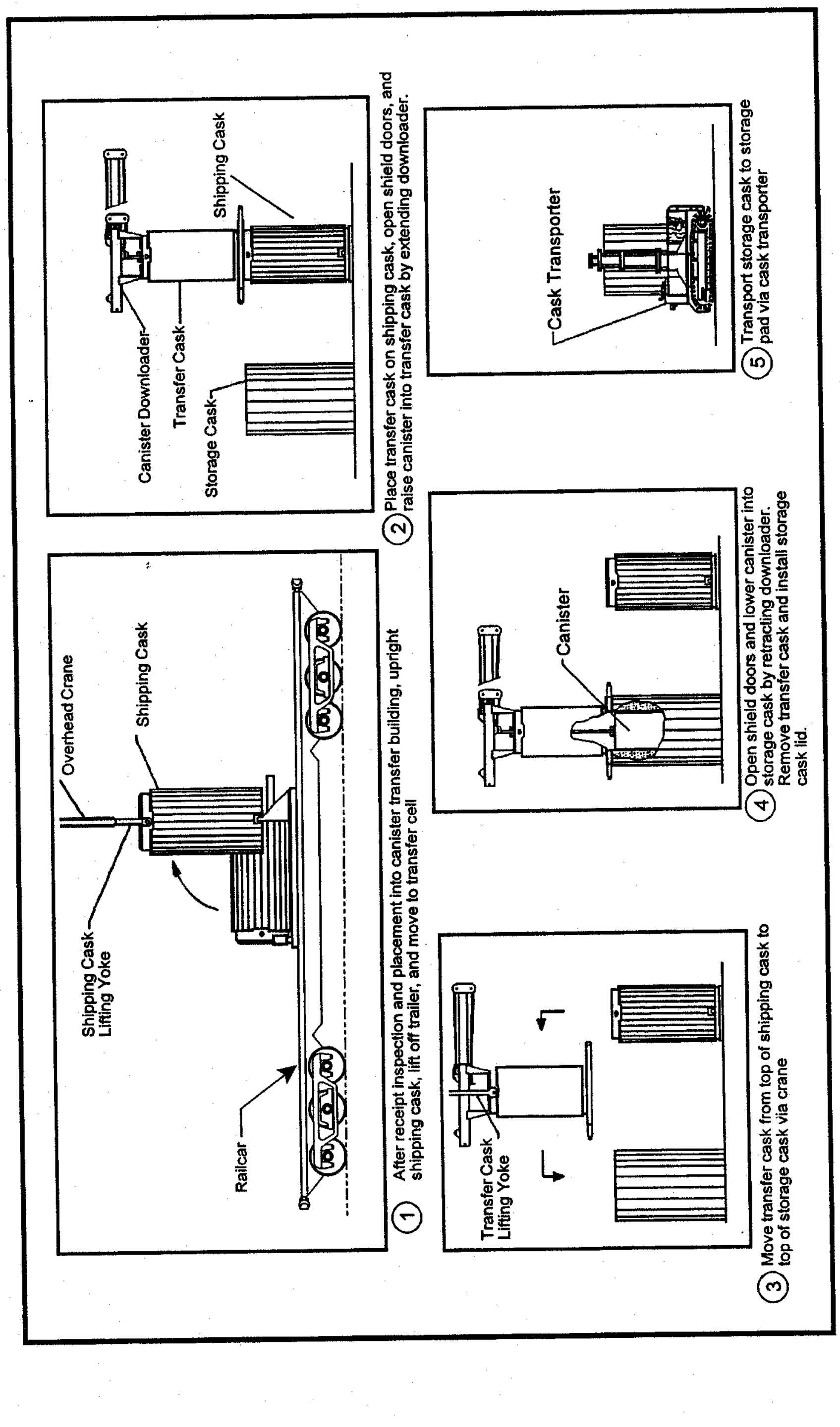

Figure 2.8. Transfer operations for spent nuclear fuel (inside sealed canisters) at the proposed PFSF.

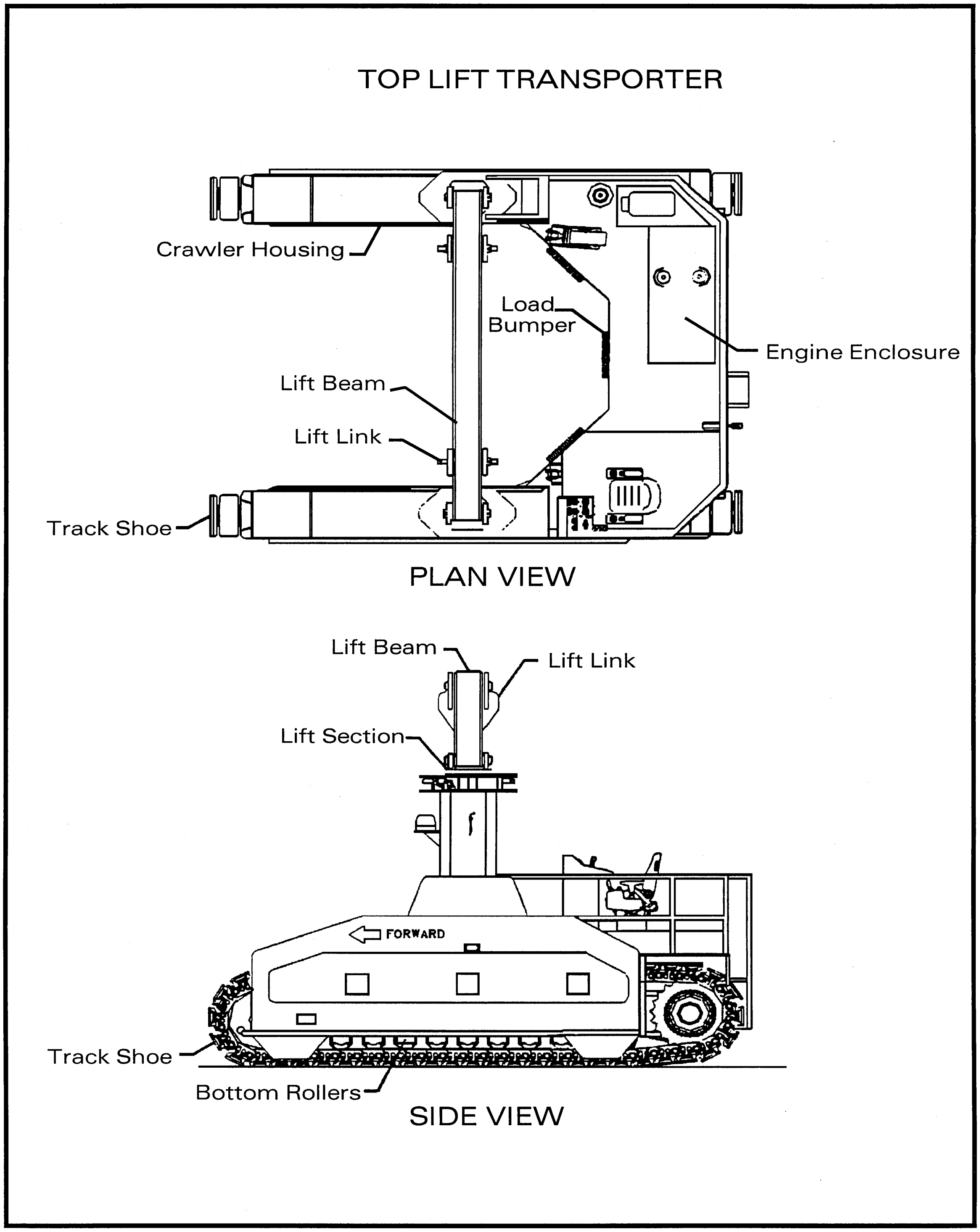

Figure 2.9. Type of storage cask transporter proposed for use at the PFSF.

CONTAINERS FOR SPENT NUCLEAR FUEL

Several types of containers for spent nuclear reactor fuel are discussed in this FEIS. These include:

Canisters are thick-walled, steel cylinders used to package and contain SNF assemblies. Canisters are hermitically sealed by welding them shut. This FEIS discusses “dual-purpose canisters” that can be used for both shipping and storing of SNF. That is, once the SNF is sealed into the dual-purpose canister, it would not need to be removed from the canister during interim storage.

Shipping Casks are thick-walled, steel cylindrical packages certified by the NRC to transport SNF.

Transfer Casks are radiation-shielded, open-bottomed cylinders used to transfer SNF canisters from shipping casks into storage casks. All transfer operations would be conducted inside a special room, or “transfer cell,” within a closed building.

Storage Casks are thick-walled , steel or steel and concrete containers certified by NRC for storing SNF. The types of storage casks discussed in this FEIS are vertical, cylindrical structures that provide radiological shielding. They are equipped with vents and channels that provide cooling by passive, natural convection processes; hence, they require very little maintenance other than periodic inspections. They are sometimes called “dry casks” because no cooling water is required.

2.1.2.2 Proposed Storage Cask System

The storage casks provide structural support for the canisters, physical protection, radiation shielding, and passive natural convection for cooling to remove decay heat while in storage. During storage, temperatures of the casks would be monitored, and periodic surveillance of the casks for vent blockage would be conducted on the basis of the requirements of the NRC license for the proposed PFSF.

PFS expects that its proposed dual-purpose canister system would be compatible with DOE's plans for placement in a permanent repository. When a DOE permanent repository becomes available, the stored SNF would be moved from the storage pads in Skull Valley and transferred to shipping casks following the same transfer operations described above but in reverse order. Shipment of SNF away from the proposed PFSF could occur at anytime during the term of the PFSF license once a permanent repository becomes available. As discussed in Chapter 8 of this EIS, under the NRC license the maximum amount of SNF that the applicant could accept at the proposed PFSF over the term of the license is 40,000 MTU (44,000 tons) of SNF. Once the applicant has accepted 40,000 MTU of SNF, the applicant may not accept any additional SNF shipments, even if the applicant has begun to ship SNF off site (as proposed in the lease between PFS and the Band).

PFS intends to operate the proposed PFSF for up to 40 years (i.e., an initial 20 year license and a 20 year renewal). The proposed PFSF would be designed to store up to 40,000 MTU (44,000 tons) of SNF from U.S. commercial reactors. While at the proposed PFSF, the SNF would remain the property of the originating power reactor generating company. The service to be provided by PFS under the terms of the proposed lease would be storage only, and all SNF would be removed from the proposed PFSF before completion of decommissioning. Consistent with the NRC's Waste Confidence Decision (see Section 1.3), by the end of that period, it is expected that a permanent repository would be available to receive the SNF from the proposed PFSF. In any event, should the NRC grant the application, service agreements (i.e., contracts) between PFS and companies storing SNF at the proposed PFSF will require that the originating companies, which own the SNF, remove all SNF from the proposed PFSF by the time PFS has completed its licensing or regulatory obligations under its NRC license. The service agreement requirement to remove the SNF from the proposed PFSF is not dependent upon the availability of a permanent geological repository. Therefore, if the PFS license is terminated before a permanent geological repository becomes available, the companies storing SNF at PFSF would continue to retain responsibility for the fuel and would be required to remove it from the proposed PFSF site.

The cask system being considered for use at the proposed PFSF is the Holtec International HI-STORM system (see Figure 2.10). The cask supplier would be responsible for design and certification by NRC of the canisters, casks, and transfer equipment. The characteristics of the HI-STORM canister and storage cask are shown in Tables 2.5 and 2.6, respectively. More detailed descriptions of the specifications for the cask, canister, and canister transfer operations may be found in Chapters 4 and 5 of the SAR and the NRC's SER, as updated.

2.1.3 Emissions, Effluents, and Solid Wastes

Atmospheric emissions (e.g., dust and vehicle exhaust) would be generated by the soil-disturbing activities associated with site preparation and construction of the storage area, the access road, the new rail siding and the new rail line. However, few atmospheric emissions are anticipated during the

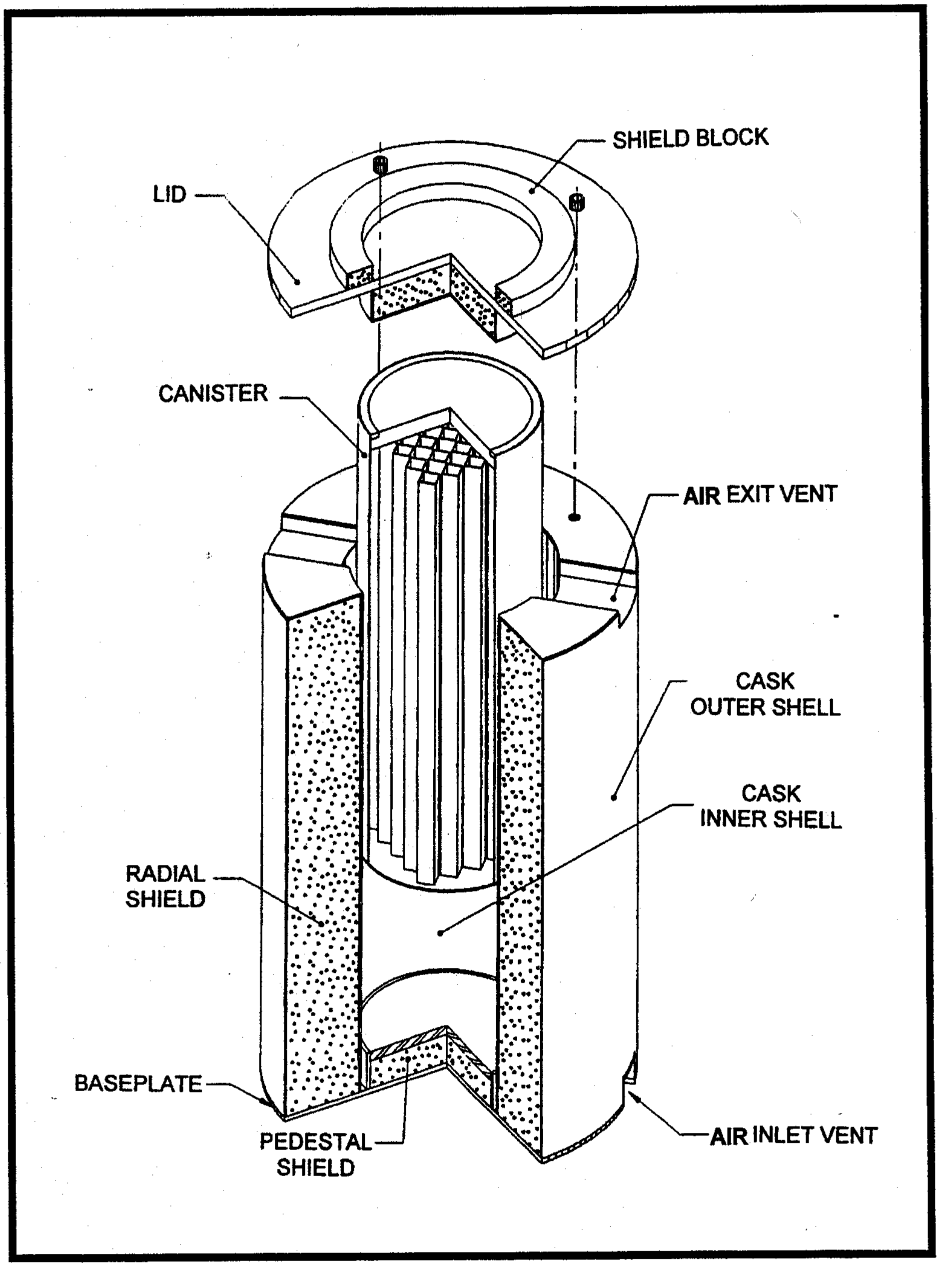

Figure 2.10. HOLTEC Hi-Storm® storage cask. Note: Air inlets and outlets would be covered by wire mesh.

Table 2.5. Characteristics of the HI-STORM canister

Parameter	Value
Outside diameter	1.7 m (5.7 ft)
Maximum length	4.8 m (15.9 ft)
Capacity	24 PWR[a] assemblies ***or*** 68 BWR[b] assemblies
Maximum heat load	20.88 kW for PWR canister 21.52 kW for BWR canister
Material of construction	Stainless steel
Maximum weight (loaded with SNF)	PWR: 36.3 MT (40.0 tons) BWR: 39.6 MT (43.6 tons)
Internal atmosphere	Helium

[a]PWR = Pressurized water reactor
[b]BWR = Boiling water reactor

Source: PFS/SAR 2001; Table 4.2-1

facility's operation. Those anticipated emissions would come from vehicles involved in transporting and transferring shipping casks, storage casks and liners, and personal cars for workers commuting to the facility. In addition, emissions would be released from the concrete batch plant, which would continue operations throughout the life of the proposed PFSF to provide concrete for the storage pads and storage casks.

The only liquid effluents that would be generated at the facility are stormwater runoff that would be directed to the detention basin and the natural drainage system, and domestic wastes that would be fed into the facility's septic system. Stormwater runoff is not expected to contain any radiological effluents since PFS intends to employ a "start clean/stay clean" philosophy. PFS has stated that it would employ "best management practices" (BMPs) to minimize atmospheric emissions and liquid effluents (see Section 2.1.4).

Drain sumps would be provided in the cask load/upload bay of the Canister Transfer Building. These sumps would catch and collect any water that drips from the shipping casks (e.g., from rainfall or melting snow) onto the floor. Water collected in these drain sumps would be sampled and analyzed to verify it is not radioactively contaminated prior to its release. In the event that contaminated water is detected, it would be collected in a suitable container, solidified by the addition of an agent (such as cement) so that it would constitute solid waste, staged in a low-level waste holding cell while awaiting shipment offsite, and then transported to a licensed low-level waste disposal facility.

The proposed PFSF is intended to be a zero-release facility. Nevertheless, solid dry low-level radioactive waste (e.g., smears, disposable clothing) could be generated while performing health physics surveys. These wastes would be collected, identified, packaged in low-level waste containers marked in accordance with the requirements of 10 CFR Part 20. These wastes would then be

Table 2.6. Characteristics of the HI-STORM storage cask system

Parameter	Value
Height	6.1 m (20.0 ft)
Outside diameter	3.4 m (11.0 ft)
Capacity	1 canister, loaded with approximately 10 MTU of SNF
Maximum radiation dose rate	
1 m (39 inches) from surface:	
Side	17 mrem/hr
Top	2 mrem/hr
On contact with surface:	
Side	35 mrem/hr
Top	5 mrem/hr
Top vents	9 mrem/hr
Bottom vents	15 mrem/hr
Material of construction	Concrete (core and lid) Steel (liner and shell)
Maximum weight (empty)	121.7 MT (134.2 tons)
Maximum weight (loaded with single SNF canister)	PWR[a]: 158.0 MT (174.2 tons) BWR[b]: 161.3 MT (177.8 tons)
Service life	More than 100 years

[a]PWR = Pressurized water reactor fuel assemblies inside canister.
[b]BWR = Boiling water reactor fuel assemblies inside canister.

Source: PFS/SAR 2001; Table 4.2-2.

temporarily stored in the holding cell of the Canister Transfer Building while awaiting shipment to a licensed offsite low-level radioactive waste disposal facility. No other radioactive wastes are expected from the proposed facility.

Other solid wastes, such as office or paper trash and lunchroom wastes, would be collected and disposed of as garbage at an off-site commercial location.

2.1.4 Best Management Practices

Best management practices (BMPs) are defined in both Federal and state regulations. EPA's definition is contained in 40 CFR 122.2, which consists of regulations that address the management of practices that could create water pollution. This definition states:

> *Best Management Practices, "BMPs," mean schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of*

> *"waters of the United States." BMPs also include treatment requirements, operating procedures, and practices to control plant site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.*

This definition is also used by the State of Utah in its Department of Environmental Quality's Stormwater General Permit for Construction Activity, Part VII. PFS has expanded the above definition and has committed to management practices that include additional pollution prevention measures. These management practices address the protection of surface waters, the preservation of existing air quality, and the prevention of erosion of the surface soils during construction of the proposed PFSF. The additional pollution prevention measures are listed in Table 2.7

2.1.5 Monitoring Programs

PFS would establish a pre-operational radiological environmental baseline to characterize the existing background levels of radiation. The baseline would include sampling for radioactivity in soil, groundwater, vegetation, and in the flesh of non-migrating animals near the proposed PFSF site. An on-going monitoring program is not necessary since the operating storage facility has no effluents that could carry radioactivity into the environment. One exception is the monitoring of water collected in drain sumps in the Canister Transfer Building (see discussion in Section 2.1.3).

Airborne monitoring (by continuous radiation air monitors) would be performed by PFS inside the Canister Transfer Building during SNF transfer operations. The building would also use area radiation monitors for recording the general building doses during canister transfer operations.

Workers at the facility would be monitored and their accumulated doses would be administratively controlled to maintain such doses within NRC regulatory limits. Monitoring of off-site individuals is not planned; however, radiation monitors [i.e., thermoluminescent dosimeters (TLDs)] would be used along the boundaries of the restricted-access area and the OCA to record radiation levels. The primary purpose of the TLDs is to monitor the direct radiation emanating from the storage casks.

To minimize the likelihood that animals could spend extensive periods of time near to the storage casks, PFS would implement monitoring and take other actions to deter animals from entering the restricted-access area. PFS would monitor for signs of any on-site wildlife activity and would take measures to prevent habitation. Small mammals and reptiles would be kept from the area by using traps, if necessary to safely capture and remove the animals. The entire facility would be surveyed by workers. If any signs of wildlife habitation are found, actions would be taken immediately to remove the animals.

An on-site meteorological monitoring program has already been established by PFS. The intent of this program is to collect data for the characterization of the local meteorology and not for radiological dispersion calculations.

At the completion of the project, the BLM right-of-way grant would require PFS to develop and implement a sampling program, either at various points along the proposed rail line right-of-way or at the proposed ITF (see Section 2.2.4.2) to assure there is no contamination. Prior to releasing the right-of-way, BLM would also require PFS to provide sample results and written certification from the NRC and the Utah Department of Environmental Quality, Division of Radiation Control that the proposed ITF or the proposed rail line right-of-way is free from radiological contaminants.

Table 2.7. Best management practices as proposed by PFS during the construction of the PFSF

Construction activity	Minimum controls or BMPs to be implemented
PFSF Site	
Construction of the flood diversion berms	Drainage ditches will be stabilized and lined with rock aggregate/rip-rap to reduce flow velocity and prohibit scouring.
Containment of sediment-ladened stormwater runoff during grading and construction	A large stormwater infiltration basin (i.e., detention basin) will be constructed at the site during the initial phase of construction to collect the majority of runoff from the construction site. The basin will be designed to capture the 100-year storm event and will be equipped with a stilling basin and an emergency overflow constructed of stabilized non-erodible material. Any solids collected within the runoff entering the basin will settle out and the water will either evaporate or will provide groundwater recharge.
Dissipation of stormwater runoff routed around the facility boundary	Flow dissipaters will be installed at each diversion channel to further reduce the velocity of the stormwater sheet flow. At a minimum, these devices will be constructed of rip-rap.
Stabilization of disturbed soils around the concrete SNF storage pads	Disturbed soils around each concrete storage pad will be permanently stabilized with a layer of limestone aggregate.
Stabilization of disturbed soils around the four buildings proposed for the site	Silt fencing and sediment traps will be installed where appropriate. The construction roads will be periodically watered down to control fugitive dust emissions.
PFSF Access Road Construction	
Construction of the flood diversion berm	The flood diversion berm constructed perpendicular to the site access road will be stabilized and lined with rock aggregate/rip-rap to reduce flow velocity and prevent scouring. If necessary, a stormwater flow dissipation device will also be placed where the diversion berm redistributes meteoric flow .
Grading and construction	Silt fencing and sediment traps will be installed where appropriate. The construction road will be periodically watered down to control fugitive dust emissions. Stone construction pads will be placed at the entrance/exit point-of-access roads to avoid excessive tracking of dirt and sediment onto county or state highways. Where appropriate, external vehicle washing (without the use of detergents) will be performed on-site, if it becomes necessary.
Fugitive dust controls	Construction road watering trucks will be used to periodically wet active construction road surfaces; stone construction entrance pads will be placed at construction road egress points to avoid excessive sediment tracking onto county or state roadways.
Drainage way construction	Box culverts will be placed at select locations under the access road entering the site. Rip-rap or other flow dissipation devices will be placed at the culvert where water is dissipated and silt fencing and/or sediment traps will be employed were appropriate.
Rail Access Corridor from Skunk Ridge	
Grading and construction	Silt fences and sediment traps will be installed where appropriate. Disturbance of soils will be limited to the extent practicable. Soils immediately around the rail line will be stabilized with crushed aggregate.
Stabilization of soil stockpiles associated with cut-and-fill operations	Soil stockpiles generated during the construction of the rail corridor will be placed in a manner to reduce erosion, and down-gradient areas will be protected by silt fencing. Temporary seeding or additional temporary soil stabilization measures will be applied, if necessary.

Table 2.7. Continued

Construction activity	Minimum controls or BMPs to be implemented
Arroyo crossings	Culverts will be placed in drainage ways along the rail corridor and will be designed to convey the runoff from a 100-year storm. In addition, stone aggregate or other flow dissipation devices will be placed to reduce stormwater velocity and minimize erosion. Sideslope soil stabilization devices, including silt fencing and aggregate, will be used where appropriate.
Universal Housekeeping BMPs	
All	Construction equipment maintenance and repair will be designated and controlled to prevent the discharge of oils, grease, hydraulic fluids, etc.
All	Waste receptacles and/or trash dumpsters will be placed at convenient locations for the regular collection of waste. Where practicable, materials suitable for recycling will be collected.
All	If external washing of construction vehicles is necessary, no detergents will be used, and the runoff will be captured in a sediment trap.
All	Adequately maintained sanitary facilities will be provided for all construction crews.

Source: PFS/ER 2001; Table 9.1-1.

2.1.6 Facility Closure and Decommissioning

At the end of its useful life (or upon termination of the lease with the Skull Valley Band or termination of the NRC license, whichever comes first), the proposed PFSF would be closed. As a condition of the lease with the Skull Valley Band and as required by NRC regulations, decommissioning of the proposed PFSF would be required prior to closure of the facility and termination of the NRC license. The objective of the radiological decommissioning would be to remove all radioactive materials having activities above the applicable NRC limits in order for the site to be released for unrestricted use. The NRC license would also contain requirements and provisions for assurance from PFS prior to and during operations that sufficient funds would be available at the end of the project's life to cover the costs of decommissioning activities. A "decommissioning fund" would be established by PFS prior to commencing operations in conjunction with the "per item" costs for receiving and storing each SNF canister. At the option of the Skull Valley Band, non-radiological decommissioning and restoration of the facility may include the removal of structures and reasonably returning the land to its original condition.

A Preliminary Decommissioning Plan is contained in Appendix B of the license application for the proposed PFSF. Because the exact nature of decommissioning cannot be predicted at this stage of the project, the information presented below represents the best available conceptual description of the activities envisioned for decommissioning of the proposed PFSF. A Final Decommissioning Plan would include information on site preparation and organization; procedures and sequences for removal of systems and components; decontamination procedures; design, procurement, and testing of any specialized equipment; identification of outside contractors to be used; procedures for removal and disposal of any radioactive materials; and a schedule of activities. The Final Decommissioning Plan must be submitted to the NRC for review and approval. This approval process would require its own environmental review under NEPA that would result in an environmental assessment or environmental impact statement as appropriate. 10 CFR 72.54(g)(1) to (6) delineates the requirements for the Final Decommissioning Plan.

The principal activities involved in decommissioning would include: (1) removal of all remaining SNF from Skull Valley, (2) the removal or disposition of all storage casks, (3) the removal or disposition of the storage pads and crushed rock, and (4) the removal of the buildings and other improvements or their transfer to the Skull Valley Band. These activities are described in detail in the following paragraphs.

The SNF contained inside sealed metal canisters (see Section 2.1.2.2) would be transferred into licensed shipping casks for transportation away from Skull Valley. The fuel assemblies would remain inside these sealed canisters such that decontamination of the canisters is not expected to be necessary. Decommissioning activities would then be limited to radiological surveys and any necessary decontamination of storage casks, storage pads, or building structures. It is not anticipated that the storage casks or pads would have residual radioactive contamination because (a) the SNF canisters would remain sealed while in Skull Valley, (b) the canisters would be radiologically surveyed at the originating reactor and again once they arrive at the proposed Skull Valley facility to ensure that there is no radiological contamination, and (c) the neutron flux levels generated by the SNF would be sufficiently low that activation of the storage casks and pads would produce negligibly small levels of radioactivity, if any.

2.1.6.1 Storage Cask Decommissioning

Following the removal of the canisters containing SNF, the empty storage casks would be surveyed to determine their levels of residual radioactivity. If the contamination levels were found to be below the applicable NRC limits for unrestricted release, then the empty storage casks would be disposed of as non-controlled material. Any contaminated storage casks would be decontaminated to levels below applicable NRC limits for unrestricted use. The fate of these items would be identified as part of the Final Decommissioning Plan.

Any empty storage casks with contamination or activation levels above applicable NRC limits for unrestricted release would be dismantled, and the contaminated or activated portions would be segregated and disposed of at a low-level waste facility. The portions or components of any such storage cask which are below the applicable NRC limits for unrestricted release would be disposed of as non-controlled material.

Storage cask decontamination and decommissioning could be performed at any time following the removal of the SNF canister; thus, storage cask decommissioning efforts could essentially be complete by the end of operations to ship the canisters off-site. The shipping casks and transfer casks (see Section 2.1.2.2) would be similarly decommissioned after they are no longer required for facility operations.

2.1.6.2 Storage Pad Decommissioning

A major portion of decommissioning would involve the disposition of the storage pads. There would be a maximum of 500 storage pads, each having a surface area of 20 by 9 m (67 by 30 ft) and a depth of 0.9 m (3 ft). PFS has identified two alternatives for decommissioning the storage pads for unrestricted use: (1) the storage pads could be left in place, and the storage area could be covered with topsoil and replanted or (2) they could be excavated, cut into smaller sections, and trucked off-site for disposal (PFS/ER 2001). The decision to leave or remove the storage pads will be made by the Skull Valley Band and the BIA prior to decommissioning of the pads. The decommissioning of the storage pads will be addressed in further NEPA review by the BIA before its approval of the Nonradiological Decommissioning Plan to be provided by PFS under the proposed lease.

In accordance with the “start-clean/stay-clean” philosophy for the proposed PFSF, the concrete storage pads are not anticipated to become radioactively activated or contaminated. However, for the purpose of assessing the impact of any decommissioning activities, PFS assumed in its license application that up to 10 percent of the total storage pad area would require surface decontamination. The maximum total surface area of the 500 pads would be 93,400 m^2 (1,005,000 ft^2). The assumed decontamination of 10 percent of this area [i.e., 9,340 m^2 (100,500 ft^2) to be decontaminated] would produce about 8.5 m^3 (300 ft^3 or 11 yd^3) of low-level waste (PFS/LA 2001, Appendix B, “Preliminary Decommissioning Plan”). This contaminated material would be collected, packaged, and disposed of at a low-level waste facility.

In the event that the storage pads are removed in their entirety, approximately 85,500 m^3 (112,000 yd^3) of material would need to be removed and disposed of. The estimated number of truckloads [with each truck hauling 15 m^3 (20 yd^3)] needed to remove this material would be about 6,200, when a factor of 0.9 is included to account for void spaces among the pieces of sectioned pads.

2.1.6.3 Decommissioning of Buildings, Structures, and Other Improvements

The future of the buildings and other improvements to be constructed by PFS on the Reservation is to be determined by the Skull Valley Band and the BIA. PFS is obligated to remove the buildings and other improvements at the request of the Skull Valley Band. PFS will collect sufficient advanced funding to accomplish any or all of the building removals. If the Band chooses to retain any or all of the buildings and other improvements once the radiological decommissioning is completed, it has the right to receive a transfer from PFS in an “intact” condition. The future use of any buildings and other improvements not removed by PFS would be at the discretion of the Band, and any impacts associated with such use is beyond the scope of this FEIS. The decommissioning of buildings and other improvements will be addressed in further NEPA review by the BIA before its approval of the Nonradiological Decommissioning Plan to be provided by PFS under its proposed lease.

The fences and peripheral structures are not expected to become contaminated. Therefore, it is expected that they would not require decontamination or special handling and would be removed or left in place as determined by the Skull Valley Band.

Upon expiration of the right-of-way, the rail line would be removed and reclaimed in accordance with the Plan of Development and right-of-way grant from the BLM. This plan calls for a radiological survey, as described in Section 2.1.5, and the removal of rail and ballast. Once the rail and ballast are removed, the remainder of the grade would have to be recontoured and reseeded. PFS would also need to file an application for abandonment authority with the STB. The STB would review the proposed abandonment and conduct an environmental review under NEPA.

If for any reason during the term of the BLM’s right-of-way grant, the right-of-way is no longer needed for the purpose for which it was issued, the BLM retains the right to require implementation of the reclamation plan. The BLM may also consider the assignment of the right-of-way to another qualified entity. Another consideration may be to reduce the level of reclamation to allow an alternative use such as converting rails to trails. If the rail line is still needed after the initial term of the right-of-way grant, PFS may apply for renewal under the terms and conditions imposed by the BLM.

2.2 Alternatives

This section examines the alternatives considered for the proposed action described in Section 2.1. The range of alternatives was determined by considering the underlying need and purpose for the proposed action. From this analysis, a set of reasonable alternatives was developed and the impacts of the proposed action were compared with the impacts that would result if a given alternative was implemented (see the comparative summary of impacts in Chapter 9).

The range of alternatives addressed in this FEIS is based upon PFS's needs (as described in Section 1.3) and upon the Skull Valley Band's need for economic development (see Section 1.5.2). These alternatives cover (a) the facility, (b) the alternative technologies available for an operational ISFSI, (c) the alternative locations for an ISFSI, (d) the transportation options for moving SNF to the site of the proposed PFSF in Skull Valley, and (e) a "no-action" alternative under which the proposed PFSF would not be built. Sections 2.2.1 through 2.2.5, respectively, discuss these alternatives in detail.

2.2.1 Alternatives to the Proposed PFSF (Not Addressed Further in this FEIS)

The proposed PFSF is intended to satisfy the need for an interim facility that would provide a safe, efficient, and economical alternative to continued SNF storage at reactor sites (see Section 1.3). Other than at-reactor storage (in SNF pools or dry casks) no other SNF storage alternatives currently exist for most power reactor companies. Alternatives to the proposed PFSF include (1) a different privately owned away-from-reactor ISFSI, (2) shipment of SNF from reactors sites without sufficient storage space to reactor sites with additional SNF storage capacity, and (3) alternatives that, in effect, eliminate the need for the proposed PFSF. Each of these three alternatives is discussed below.

2.2.1.1 A Different Privately Owned ISFSI

Any away-from reactor ISFSI would be required to meet the requirements in 10 CFR Part 72. Other than the proposed PFSF, no other commercially owned away-from-reactor dry cask storage system ISFSIs are available or have been proposed. In July 1998, the NRC staff received correspondence that indicated that the Owl Creek Energy Project intended to submit an application for an away-from-reactor ISFSI by the fourth quarter of 1999. The Owl Creek Project indicated that the application would propose siting the ISFSI in Fremont County, Wyoming, and would adopt the DOE's Central Interim Storage Facility (CISF) design. To date, the Owl Creek Energy Project has not submitted an application and no pre-application meetings have been conducted. Additionally, the NRC received an application submitted on October 19, 1998, from P&A Engineering for a license for the Pigeon Spur Fuel Storage Facility in Box Elder County, Utah. On January 8, 1999, the NRC staff informed the sponsor of the Pigeon Spur Fuel Storage Facility that its application was insufficient for review in accordance with 10 CFR Part 72. As a result, the NRC staff rejected the application and no further review of that application has taken place.

Because these additional facilities are not currently available for use, and no application is currently under review for such facilities, the NRC staff considers these as alternatives that are not reasonable;

and, therefore, they are not analyzed in detail in this EIS. As discussed in Chapter 7, the NRC staff evaluated the applicant's site selection process to determine if a site considered by the applicant was obviously superior to the proposed site. The location proposed by Owl Creek Energy Project is within the same geographic region as the PFS alternate site location discussed in Chapter 7. The location of the Pigeon Spur site was not one of the candidate sites considered by the applicant, and is not considered herein. Neither the applicant nor the Cooperating Federal Agencies are required to consider every possible site, but only to give appropriate consideration to alternate sites.

2.2.1.2 Shipment of SNF Between Reactor Sites

This alternative would require, in most cases, that a reactor licensee agrees to receive another reactor's SNF. To date, NRC has issued licenses to two reactor licensees to transfer SNF from one reactor site to another for storage of SNF. In each case, the receiving and shipping reactor sites were owned by the same company. No reactor licensees have requested approval from NRC to accept SNF from a reactor site owned by another company, and no proposals for such requests have been identified to date. NRC approval would be needed before a reactor site could store SNF from another site. In most cases, a license amendment would be required, and the license amendment process would include a NEPA review. For the following reason, it is unlikely that this alternative would provide sufficient capacity to satisfy the interim SNF storage needs for the PFS members or the industry: all operating reactors continue to reduce their unused spent fuel pool storage capacity with each refueling outage, and no reactor licensee has identified an interest in receiving SNF from other companies for storage. Accordingly, this is not considered to be a reasonable or feasible alternative.

The environmental impacts of this alternative would depend upon site-specific considerations related to any particular proposed transfer, and the particular transportation impacts that might result. Without identifying specific reactor sites that might be involved in this alternative, the discussion of cross-country transportation impacts in Section 5.7 provides a reasonable discussion of the potential transportation impacts. For the reasons discussed above, this alternative was not evaluated in detail in this FEIS.

2.2.1.3 Alternatives That, in Effect, Eliminate the Need for the Proposed PFSF

The need for the facility could be eliminated by the Federal Government taking possession and title to the SNF at all reactor sites and ISFSIs in a manner that would allow sufficient on-site storage to be maintained. This would allow plant operations to continue and would allow decommissioning to be completed for reactors that have already been shutdown.

During a Congressional hearing before the Subcommittee on Energy and Power in 1999, the Secretary of Energy presented a proposal that would have the Federal Government take title to utilities' SNF at reactor sites until a repository is opened. The Secretary of Energy stated that "the Department is only at the beginning of the process of analyzing this approach and discussing it with the utility industry and other parties." The proposal, as presented to date, would be very similar from an environmental standpoint to the no action alternative (see Section 2.2.5), in that the SNF would remain at each reactor site. However, the Secretary also stated that " we would still have to address a range of issues, including liability, financial and operational responsibilities." With such critical issues still being considered, and in the absence of further Government initiatives to advance this concept, the Secretary's proposal is not considered to be a candidate for evaluation as a reasonable or feasible alternative to the proposed action in Skull Valley; hence, no such evaluation has been made in this FEIS.

On July 19, 2000, DOE and Philadelphia Electric and Gas Company (PECO) amended the Peach Bottom contract for disposal of SNF and/or high-level radioactive waste.[2] The amendment added a provision that would allow PECO to transfer title of the Peach Bottom storage casks and ISFSI to the DOE. Some key terms and agreements of the title transfer still need to be finalized if the contract provision is to be executed, such as the issues of liability, and DOE's legal authority to take title to the Peach Bottom storage casks and ISFSI. Although this contract is in place, the NRC staff continues to believe that completion of a detailed analysis of this alternative would require speculation on some of its key aspects that continue to remain uncertain. Hence, no such evaluation of this concept has been made in this EIS.

2.2.2 Alternative Technology

2.2.2.1 Dry Storage Systems

PFS identified five types of SNF dry storage systems (see the dialogue box in this section) for use at the proposed PFSF, which are (1) single-purpose cask systems, (2) single-purpose canister systems, (3) dual-purpose cask systems, (4) dual-purpose canister systems, and (5) modular vault dry storage systems (PFS/ER 2001). PFS indicated that it selected the dual-purpose canister system described in Section 2.1 for the following reasons. First, it eliminates the need to handle or expose individual SNF assemblies during transfer after a canister is loaded and sealed at the originating power reactor; and second, the use of the proposed dual-purpose canisters system, with separate transportation and storage overpacks (i.e., casks) for the canister, costs less than a dual-purpose cask system with a single cask for both transportation and storage, because each storage cask does not need to be licensed and built to meet 10 CFR Part 71 transportation requirements.

The other dry storage systems would be constructed of materials similar to those used for the proposed system and SNF would have to be transported to the proposed PFSF site in a manner similar to the PFS proposal. The other dry storage systems would be required to meet the standards set forth in 10 CFR Part 72, and the environmental impacts would not be significantly different from those associated with the proposed system. Accordingly, this FEIS does not include a detailed evaluation of other current dry storage system designs.

2.2.2.2 Wet Storage Systems

The NRC staff considers both wet and dry storage of SNF storage to be safe. The regulations in 10 CFR Part 72 govern the design and operation of wet and dry SNF storage systems. A wet ISFSI would require packaging of the fuel at the reactor site for shipment, unpackaging of the SNF at the ISFSI site, and placement of the SNF into a storage pool. Currently, DOE plans to employ dry cask storage technology at a permanent repository; therefore, it would be necessary for SNF stored at a wet ISFSI to be packaged again prior to shipment to a permanent repository. In addition, a wet ISFSI would require more operational, maintenance, and surveillance activities to maintain its safety than a dry-cask storage system, which relies on passive features to maintain cooling and radiation shielding. The additional packaging of the SNF and operational, maintenance, and surveillance activities would

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[2] All utilities have contracts with DOE for disposal of SNF and/or high level radioactive waste. These contracts are consistent with the model contract in 10 CFR Part 961.

Generic Types of Dry Cask Storage Systems for Spent Nuclear Fuel

Single Purpose, Directly-Loaded Storage Cask—Is a cask designed to meet only the NRC storage cask requirements in 10 CFR Part 72. This type of storage cask would be used to store SNF that has been directly loaded into a basket or fuel cells that are contained within a steel shielding overpack, which in turn is sealed by a bolted lid with double metallic seals. The cask would not be authorized for use in shipping the SNF under the transportation requirements in 10 CFR Part 71; therefore, use of this type of storage cask at the proposed PFSF would require the SNF to be loaded into a separate NRC-approved shipping cask for shipment of the SNF to and from the proposed PFSF. This would require a fuel transfer facility at the proposed PFSF in order to transfer the SNF to and from the storage cask and shipping cask. Conceptually, the fuel transfer facility would be designed to transfer bare SNF (i.e., individual unshielded fuel assemblies) to and from the storage cask and shipping cask by means of either a dry transfer system (e.g., hot cell) or a wet transfer system (e.g., fuel pool). The fuel transfer facility would likely need to maintain a negative pressure to ensure radioactive material would not escape the facility, and all air exiting the building would be routed through high efficiency particular air (HEPA) filters to capture any airborne radioactive particles. A wet pool transfer system would also require active filtration systems to minimize water contamination. In addition, use of this type of storage cask would likely require an active seal monitoring system and would possibly require a seal maintenance facility to inspect, repair, and replace the cask seals, if necessary.

Single Purpose, Canister-Based Storage Cask—Is a cask designed to meet only the NRC storage cask requirements in 10 CFR Part 72. This type of storage cask would be used to store SNF that is inside a sealed (welded) steel canister. During storage, the canister would be placed in a metal or concrete overpack which provides radiation shielding. The canister would be passively cooled by natural convection heat transfer through air vents on a concrete overpack or by direct conduction through a metal overpack. The canister would not be authorized for use in shipping inside any overpack under the transportation requirements in 10 CFR Part 71; therefore, use of this type of storage cask at the proposed PFSF would conceptually require a fuel transfer facility—similar to that described above—in order to transfer the SNF to and from the storage cask and shipping cask. The fuel transfer facility would also likely require additional equipment needed for closing (welding) and opening (cutting) the canister at the proposed PFSF.

Dual Purpose, Directly-Loaded Cask System—Is a cask system designed to meet both the NRC storage cask requirements in 10 CFR Part 72 and the NRC transportation requirements in 10 CFR Part 71. This type of storage cask system would be used to store SNF that has been loaded into a basket or fuel cells that are contained within a steel shielding overpack, which in turn is sealed by a bolted lid with double metallic seals. The same overpack could be used for both storage and shipment. This cask system would not require a fuel transfer facility and, therefore, could be shipped to and from the proposed PFSF without directly handling the SNF. In addition, use of this cask system would likely require an active seal monitoring system and would possibly require a seal maintenance facility to inspect, repair, and replace the cask seals, if necessary.

Dual Purpose, Canister-Based Cask System—Is a cask system designed to meet both the NRC storage cask requirements in 10 CFR Part 72 and the transportation requirements in 10 CFR Part 71. This type of storage cask system would be used to store SNF that is inside a sealed (welded) steel canister. During storage, the canister would be placed in a metal or concrete overpack which provides radiation shielding. This cask system would not require a fuel transfer facility and, therefore, could be shipped to and from the proposed PFSF without directly handling the SNF. However, the canister would be placed into a different NRC-approved metal overpack for shipment to and from the proposed PFSF. Therefore, this cask system would require a canister transfer facility at the proposed PFSF. This is the type of cask system (including the canister transfer building) that would be used at the proposed PFSF. See Section 2.1.2 of this FEIS for a further, more detailed description.

(Continued on next page)

Dry Cask Storage Systems (continued)

Modular Vault Dry Store System—Is a large concrete storage vault designed to store several storage containers of SNF under the NRC storage requirements of 10 CFR Part 72. Conceptually, SNF would be placed in tube-like metal containers which serve as the primary confinement boundary. Each container could store approximately four PWR assemblies and be sealed by a bolted lid with double O-rings. The containers are placed in the concrete vault and are cooled by passive natural convection through large vents in the storage vault. The vault could be designed to store several modules of SNF storage containers. Each module could hold up to 36 storage containers. The containers would be placed into a NRC-approved metal overpack for shipment to and from the proposed PFSF. This cask system would not require a fuel transfer facility and, therefore, could be shipped to and from the proposed PFSF without the need to directly handle the SNF. Because of the low capacity of individual containers, additional shipments to and from the proposed PFSF would likely be required, as compared to use of traditional storage casks. At the proposed PFSF the containers would be removed from the transportation cask and inserted into the vault. Inspection and replacement of O-rings might also possibly be necessary.

result in a loss of efficiency and increased costs. A wet ISFSI also would involve additional handling of the fuel, which would likely lead to higher radiation exposure for workers, as well as an increase in the risk of a fuel-handling accident. For these reasons, alternatives that employ wet storage technologies have not been evaluated further in this FEIS.

2.2.3 Alternative Sites

PFS undertook a site selection process in 1996 to identify viable locations for the proposed ISFSI. The site selection process and criteria used by PFS are described in Chapter 7 and in Appendix F. Through its site selection process, PFS identified the Reservation as its preferred site. Once the preferred site was identified, a preferred location was selected (i.e., Site A) for the PFSF. In addition, PFS identified an alternative location on the Reservation (i.e., Site B). PFS also identified a site in Fremont County, Wyoming, as an alternative, secondary site (see Section 2.2.3.3); however, PFS has elected to pursue the leasing and development of the Skull Valley site. The license application that is the subject of this FEIS specifically applies only to the Skull Valley site; however, this FEIS compares the proposed site to two alternative sites to determine if such an alternative site is an obviously superior alternative to the proposed PFSF site. The Wyoming location is evaluated in Chapter 7 of this FEIS as an alternative to the site proposed in PFS’s license application.

2.2.3.1 Site A at the Reservation

The PFS site-selection process resulted in the identification of a primary and an alternative ISFSI site for consideration on the Reservation. The Skull Valley Band determined the candidate site area on the Reservation. The only offered land on the Reservation encompassed sections in the northwest corner of the Reservation (see Figure 2.1 and the discussion in Section 2.1.1 of this FEIS). Two potential locations, Site A and Site B, were identified by PFS on the Reservation within the area proposed (i.e., within Sections 6 and 7 of T5S/R8W) by the Skull Valley Band. These potential sites were evaluated and a final site (i.e., Site A) was selected. Only minor differences existed between the two sites. The proposed site (Site A) was selected over the alternative site because of its greater distance to the nearest resident’s home [3.2 km (2.0 miles) to the east-southeast].

2.2.3.2 Site B at the Reservation

As shown in Figure 2.11, Site B in Skull Valley is located about 800 m (0.5 mile) south of the proposed site (Site A), 1.6 km (1 mile) north of the Hickman Knolls outcropping, and 4.5 km (2.8 miles) north of the inactive Tekoi Rocket Motor Test facility. Approximately one-half of Site B is in Section 6 of T5S/R8W, with the other half in Section 7 of T5S/R8W. The resident's home nearest to Site B is approximately 3.1 km (1.9 miles) to the east. While only minor differences exist between site A and B, both sites were evaluated in detail to present a full discussion of the potential impacts associated with each site on the Reservation for the BIA decision maker. Selection of Site B in any Record of Decision would require the Skull Valley Band and PFS to amend the proposed lease (which currently applies only to Site A.)

2.2.3.3 Fremont County, Wyoming, Site

The alternative site in Wyoming (see Figure 2.12) is located north of Shoshoni, Wyoming, about 39 km (24 miles) northeast of Riverton and about 16 km (10 miles) southeast of the Owl Creek Mountains. It is also about 9 km (6 miles) east of the Wind River Indian Reservation. The site is described and analyzed in greater detail in Chapter 7.

2.2.4 Transportation Options

2.2.4.1 National Transportation Options

The PFSF is designed to employ dual-purpose canister-based storage systems. Because of the size and weight of the licensed shipping casks, shipment by rail is the only practicable cross-country transportation option for the SNF to be delivered to Skull Valley. While movement of SNF casks of this size is sometimes accomplished by specialized, heavy-haul truck and trailers, this is usually done only over short distances. Heavy-haul trucks and trailers typically travel at speeds of 10–20 mph, thus making them impractical for transporting SNF cross-county. Accordingly, truck transportation is not considered a viable option for cross-country transportation to the proposed PFSF and is not analyzed in detail. Smaller shipping casks have been certified for SNF transport, but they would require additional transfer operations at the PFSF, and would have greater environmental impacts than cross-country rail transportation using a dual-purpose canister system. If PFS decides to use a dual-purpose canister based cask system different from that included in its license request, including a design that can be transported by truck, PFS would be required to amend its license. The license amendment would require a new NEPA review that would evaluate the impacts of cross-country truck transportation and associated transfer operations.

2.2.4.2 Local Transportation Options (in Skull Valley)

In this FEIS, the phrase "local transportation options" refers to the alternatives for moving SNF from the existing Union Pacific main rail line to the proposed PFSF on the Reservation. PFS has submitted two applications to the BLM: one as their proposed action and the other as an alternative proposal. The proposed action, as described in Section 2.1.1.3, involves the construction of a new rail line from Skunk Ridge. PFS's alternative proposal is construction of a new ITF near Timpie, Utah, and the use of heavy-haul tractor/trailers from the ITF to the PFSF via the existing Skull Valley Road. Since the BLM would approve only one of these right-of-way applications, or would deny them both, these two local transportation options are considered separately in this FEIS.

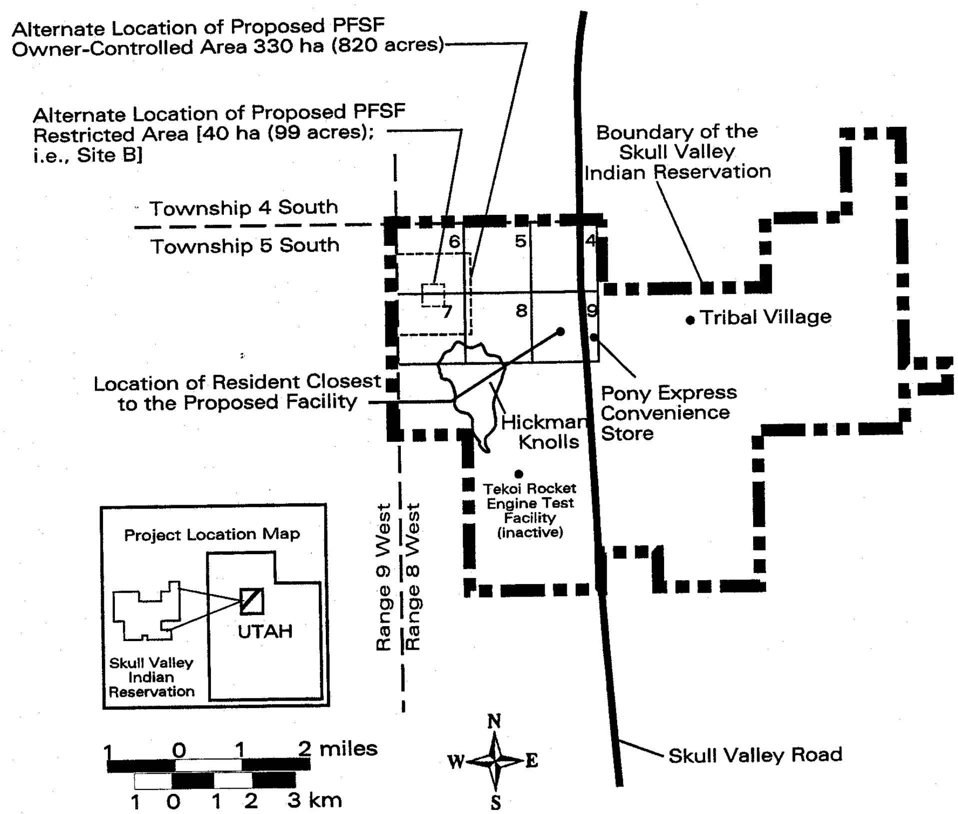


Figure 2.11. Alternative site (i.e., Site B) for the proposed PFSF on the Reservation.

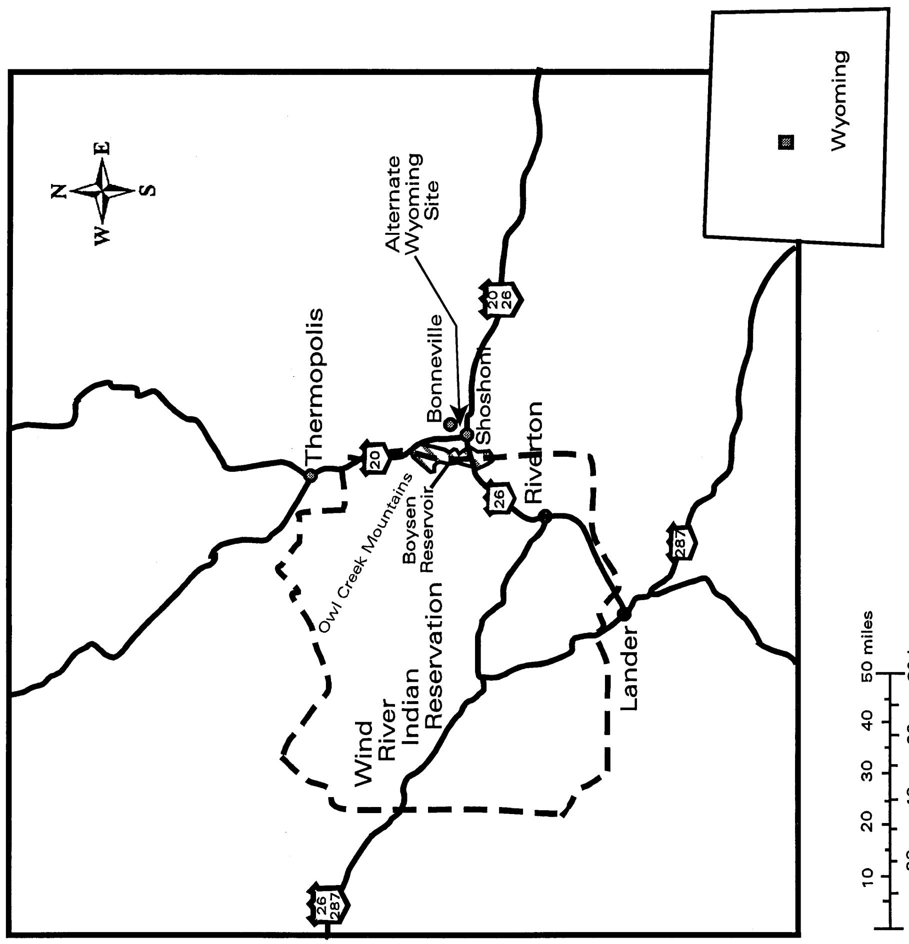


Figure 2.12. Location of an alternative ISFSI site in Fremont County, Wyoming.

Several other local transportation options were considered but eliminated from detailed analysis. Below is a summary of the ITF alternative evaluated in detail in this FEIS, as well as the other transportation alternatives considered but eliminated from further evaluation.

The ITF alternative. An alternative to the proposed new rail corridor through Skull Valley would be the use of an ITF, where SNF shipping casks would be transferred from railcars to heavy-haul vehicles for transport to the proposed PFSF. PFS has filed a right-of-way application with the BLM to construct and operate an ITF near Timpie, Utah. The ITF would be located approximately 2.9 km (1.8 miles) west of the intersection of Interstate 80 and the Skull Valley Road (see Figure 2.13), and approximately 39 km (24 miles) north of the site for the proposed PFSF. The existing Skull Valley Road would be used to transport the SNF shipping casks from the ITF to the PFSF. The descriptions below are taken from PFS's Plan of Development for the proposed ITF (Hennessy 1999).

The right-of-way parcel lies between the existing Union Pacific rail line to the north and an existing frontage road to the south (see Figure 2.14). Construction of the ITF would be scheduled to begin upon issuance of the required approvals for the proposed PFSF and would be expected to last less than one year. The peak workforce would be 35 workers during the construction period.

The right-of-way parcel for the ITF would be approximately 300 m (1,000 ft) long and 100 m (350 ft) wide. The parcel would be connected to the existing frontage road by way of a new 9-m (30-ft) wide asphalt-paved road within a corridor of approximately 80 m by 30 m (270 ft by 100 ft). A new rail siding would also be constructed as part of the ITF. The total area of the ITF parcel is about 3.6 ha (9 acres). The total project area would be about 4.4 ha (11 acres), including 0.8 ha (2 acres) of land for the proposed new rail siding which would be located entirely on the existing Union Pacific right-of-way (see Figure 2.14).

Clearing of the ITF project area would involve the removal and disposal of vegetation within the right-of-way. Any woody vegetation would be shredded and scattered in place. Topsoil at the site would not be stockpiled, and the right-of-way would not be revegetated. All 4.4 ha (11 acres) have been previously disturbed, and they would remain disturbed for the life of the project if the ITF were constructed.

The ITF would be designed to transfer cargo from railcars onto heavy-haul tractor/trailers. As shown in Figure 2.14, the proposed ITF would include one pre-engineered metal building (i.e., the Transfer Building) to house a single-failure-proof, 150-ton gantry crane for transferring cargo from rail to truck, a short rail siding, and a road that would loop around the perimeter of the facility to provide maneuvering space for the heavy-haul tractor/trailer rigs. The loop road would connect to the proposed ITF access road, which in turn would connect to the existing frontage road. In addition to thenew access road, gravel or paved areas would be needed to park and maneuver the heavy-haul tractor/trailer rigs and to provide parking for worker's vehicles.

The ITF Transfer Building would be about 24 m (80 ft) wide, 60 m (200 ft) long, and 16.5 m (54 ft) high. Excavation would be required at the site for installation of the foundation supporting the crane and the building's framework. The facility would be immediately surrounded by a 2.4-m (8-ft) chain link fence to control public access, and it would be illuminated at night by sodium vapor yard lights. A range fence would enclose a buffer area around the entire facility (see Figure 2.14).

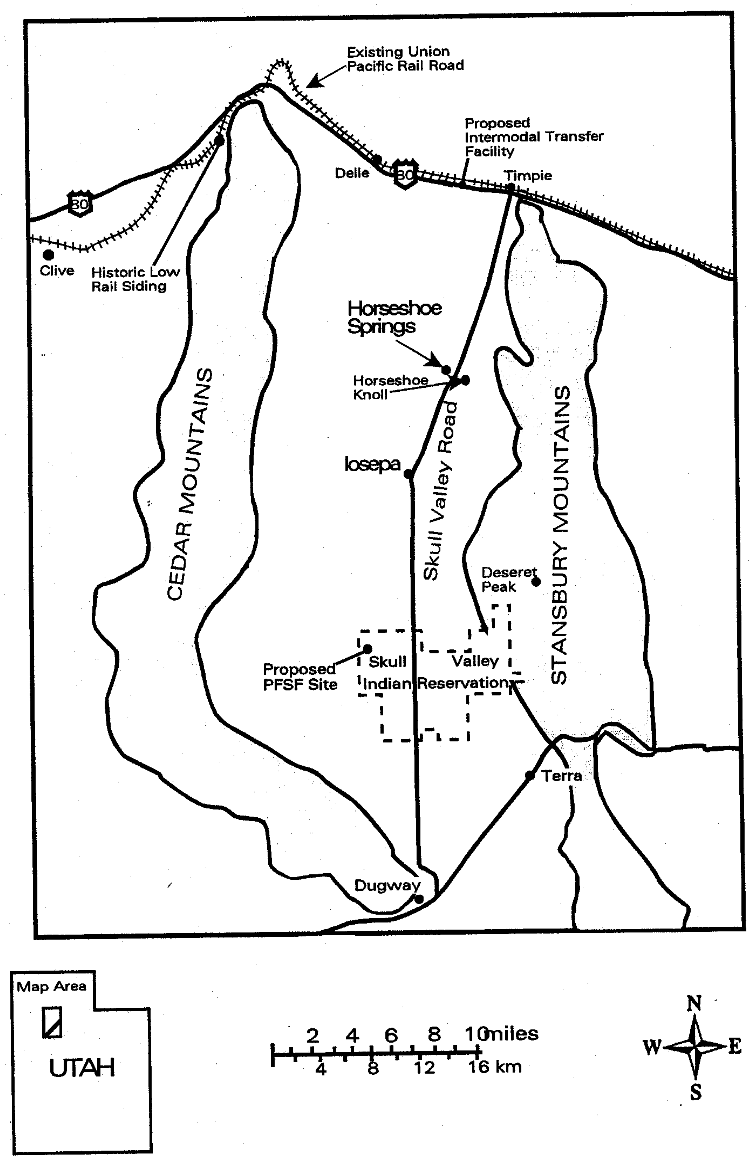


Figure 2.13. Proposed location of an Intermodal Transfer Facility in Skull Valley.

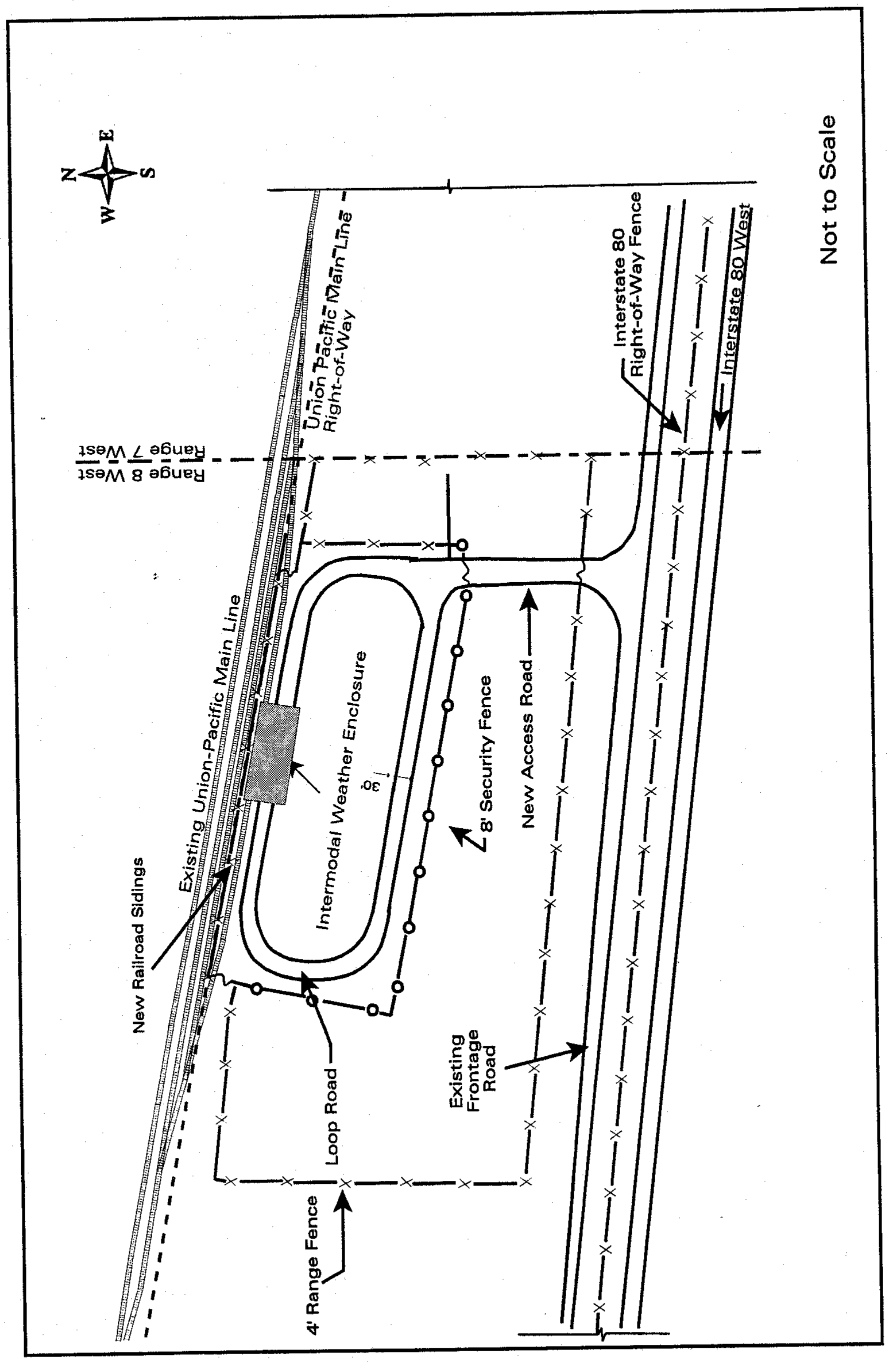


Figure 2.14. Basic site plan and layout for the Intermodal Transfer Facility.

Potable water would be provided for the ITF in an on-site water storage tank and water distribution system. The tank would be refilled periodically by a local commercial drinking water supplier. Sewage facilities would be provided by an on-site septic system and drain field.

The new rail siding for the proposed ITF would consist of three sections of sidetrack connected to the main line with switches and turnouts. The rail siding would be about 780 m (2,550 ft) long and would be located entirely upon the adjacent Union Pacific right-of-way. Approximately 4,100 m^3 (5,400 yd^3) of sub-ballast and 3,300 m^3 (4,300 yd^3) of ballast would be required. Table 2.8 provides a list of the materials that would be needed to construct the ITF.

Table 2.8. Materials to be imported and used in the construction of an intermodal transfer facility (ITF) near Timpie, Utah

Material type		Material Required
Concrete aggregate		
	Small (sand)	880 m^3 (1,150 yd^3)
	Large (crushed rock)	1,200 m^3 (1,600 yd^3)
	Total concrete aggregate	2,100 m^3 (2,750 yd^3)
Crushed rock		
	Access road base	500 m^3 (650 yd^3)
	Oval track base	2,300 m^3 (3,000 yd^3)
	Total crushed rock	2,800 m^3 (3,650 yd^3)
Structural fill materials		2,000 m^3 (2,700 yd^3)
Sub-ballast		4,170 m^3 (5,450 yd^3)
Ballast		3,300 m^3 (4,300 yd^3)
Asphalt paving		1,900 m^3 (2,500 yd^3)

Source: PFS/ER 2001; Table 4.1-6

Construction of the ITF would require a total daily water use of about 80 m^3/day (21,200 gal/day), which would be primarily associated with dust control and soil compaction. This water would be provided by local commercial suppliers and would be transported to the site in tanker trucks.

If an ITF were constructed, then only three casks per train could be accommodated on shipments of SNF to Skull Valley from existing nuclear reactors. To achieve the maximum receipt rate of 200 casks per year, the ITF would be operated to receive two equivalent incoming trains per week carrying two casks per train (i.e., an average of four casks per week). A four-man crew would be expected to handle the transfer operations at the ITF.

The type of heavy-haul trailers proposed for use on Skull Valley Road range from 45 to 55 m (150 to 180 ft) in length and are typically 3.7 m (12 ft) wide (see Figure 2.15). These vehicles use dozens of tires to distribute the weight within typical highway load limits; nevertheless, the use of such trailers on Skull Valley Road would require a permit from the state of Utah due to their overall weight and length. No upgrades or improvements to the existing Skull Valley Road have been proposed by PFS for the transportation alternative involving a new ITF and the use of heavy-haul vehicles.

A minimum of two heavy-haul tractor/trailers would be used to move the SNF shipping casks from the ITF to the proposed PFSF. The heavy-haul tractor/trailer would move at no more than 30 km/h (20 mph) along Skull Valley Road. To transport the maximum of 200 shipping casks per year, two to four tractor trailer round-trips would be scheduled each week. The heavy-haul vehicles would be refueled from a self-contained diesel fuel filling tank located near the Operations and Maintenance Building at the proposed PFSF. This tank would be similar to the tank described in Section 2.1.1.2 for the cask transporter vehicles, except that its capacity would be 4.5 m^3 (1,200 gal). Once at the proposed PFSF, the shipping casks would be unloaded and handled the same as if they had been transported to the PFSF by the proposed Skunk Ridge rail corridor (see Section 2.1.2.1).

PFS has stated that the decommissioning and closure of the ITF would involve the dismantling and removal of the following structures: the rail siding, the pre-engineered metal building and its foundation, and the access road. The disturbed areas would be covered with topsoil and replanted with vegetation.

Local transportation options and alternatives considered but eliminated from detailed evaluation. Other local transportation schemes were considered but eliminated from detailed evaluation. These alternatives are discussed below.

Construction of a new rail line from a location other than Skunk Ridge. Building a new rail line from any location other than Skunk Ridge would involve the construction of a new siding to the north of Interstate 80, creating an unresolved problem in how to cross the interstate to reach the Reservation to the south. Construction of a new rail line on the eastern side of Skull Valley parallel to the Skull Valley Road was eliminated from analysis due to the likelihood for any such construction activity to directly impact wetlands at Horseshoe Springs (see Figure 1.3), existing houses and ranches, or traffic on Skull Valley Road. Thus, this alternative is not evaluated in this FEIS.

Another location considered was a rail line option that would use an existing rail line east of the Stansbury Mountains with a new corridor around the north end of these mountains (i.e., between the mountains and Interstate 80) and continuing south along Skull Valley Road. This option would result in construction impacts to the wetlands, houses, ranches, and traffic along Skull Valley Road, as well as substantial excavation at the north end of the Stansbury Mountains. Thus, this alternative is not evaluated in this FEIS.

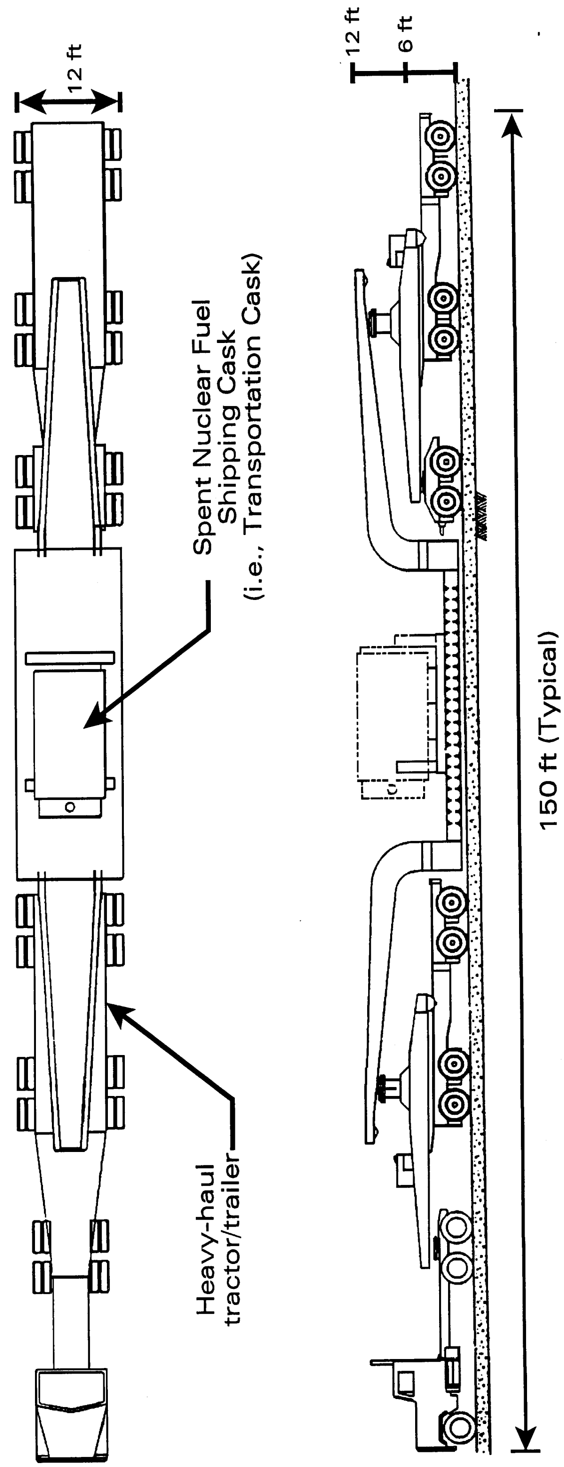


Figure 2.15. Typical heavy-haul tractor/trailer rig used for transporting spent nuclear fuel shipping casks.

Construction of an alternative route/alignment from Skunk Ridge. PFS has identified an alternate alignment to the proposed route for the new rail line (see Section 2.1.1.3 and Figure 1.2) that would connect the new rail siding at Skunk Ridge with the Reservation. The alternative route (called the west valley rail alternative) would lie about 600 to 900 m (2,000 to 3,000 ft) east of the proposed route over a length of about 10.5 km (6.5 miles) (see Figure 2.16). Other routes farther to the east of the alternative route would fall on State land, which PFS has stated would be in conflict with the selection and design criteria for their proposed rail route.

The alignment of the proposed rail route generally follows the 1335-m (4380-ft) contour line (i.e., elevation above mean sea level) along the eastern foot of the Cedar Mountains. This elevation is approximately the same as the elevation of Site A on the Reservation (see Section 2.1.1.1). The grade (or slope) of either rail alignment would be limited to 1.5 percent, based on PFS's determination of the best fit of locomotive tractive effort and horsepower, as well as locomotive braking and safety considerations. PFS has stated that the proposed route, with a maximum grade of 1.5 percent, would create a balance between the amounts of material removed to the level of the rail bed (i.e., "cut" areas) and the amounts required in "fill" areas. The west valley rail alternative, however, would follow undulating terrain and, over most of its length, would be constructed on land with an elevation approximately 30 to 45 m (100 to 150 ft) lower than the proposed alignment. The west valley rail alternative would have to be built almost entirely on fill material. In addition, the rail bed of the alternative route would have to be built to elevations up to 6 m (20 ft) above existing grade levels, because of the constraint imposed by the 1.5 percent grade limitation. This raised rail bed would have a visual impact and could interfere with the access to existing roads and grazing allotments, the movement of wildlife, and the fighting of wildfires in the Cedar Mountains and in the western portion of Skull Valley. PFS has estimated that the west valley rail alternative would require the emplacement of approximately 428,000 m^3 (560,000 yd^3) of fill material and raised rail bed, of which about 200,000 m^3 (260,000 yd^3) would have to be imported to the construction site from other locations. The proposed alignment avoids the above types of impacts by more closely following existing contours and grade levels and by minimizing the height of the rail bed at grade crossings for vehicles.

As explained below, impacts to wilderness values from the proposed rail line would not significantly differ from impacts expected from the west valley alternative route, because the North Cedar Mountains contain no wilderness or wilderness study designation and contain no wilderness values or characteristics. In 1980, BLM considered the northern portion of the Cedar Mountains for designation as wilderness during its Utah land inventory process. The area was found to lack naturalness (i.e., it did not fit the attributes of being affected primarily by the forces of nature, with the imprint of man's work substantially unnoticeable); outstanding opportunities for solitude or a primitive and unconfined type recreation; and supplemental values (i.e., ecological, geological, or other features of scientific, educational, scenic, or historical value). Based on the wilderness characteristic analysis, BLM recommended the North Cedar Mountains area <u>not</u> be designated a wilderness study area (see 45 *Fed. Reg.* 75602-75604).

Pursuant to BLM's *Wilderness Inventory and Study Procedures* (in BLM Manual H-6310-1), the Southern Utah Wilderness Alliance (SUWA) submitted a proposal to BLM on April 11, 2001, suggesting the proposal contained "supplemental and new information" that would compel BLM to revisit the 1980 North Cedar Mountains determination. Although the SUWA proposal contained the required elements, as outlined in BLM Manual H-6310-1, the proposal did not describe or present information which differed significantly from information in prior BLM inventories regarding the wilderness values of the area. The proponent (i.e., SUWA) did not provide any significant new information that would change the 1980 intensive inventory determination, or support a re-evaluation of the area.

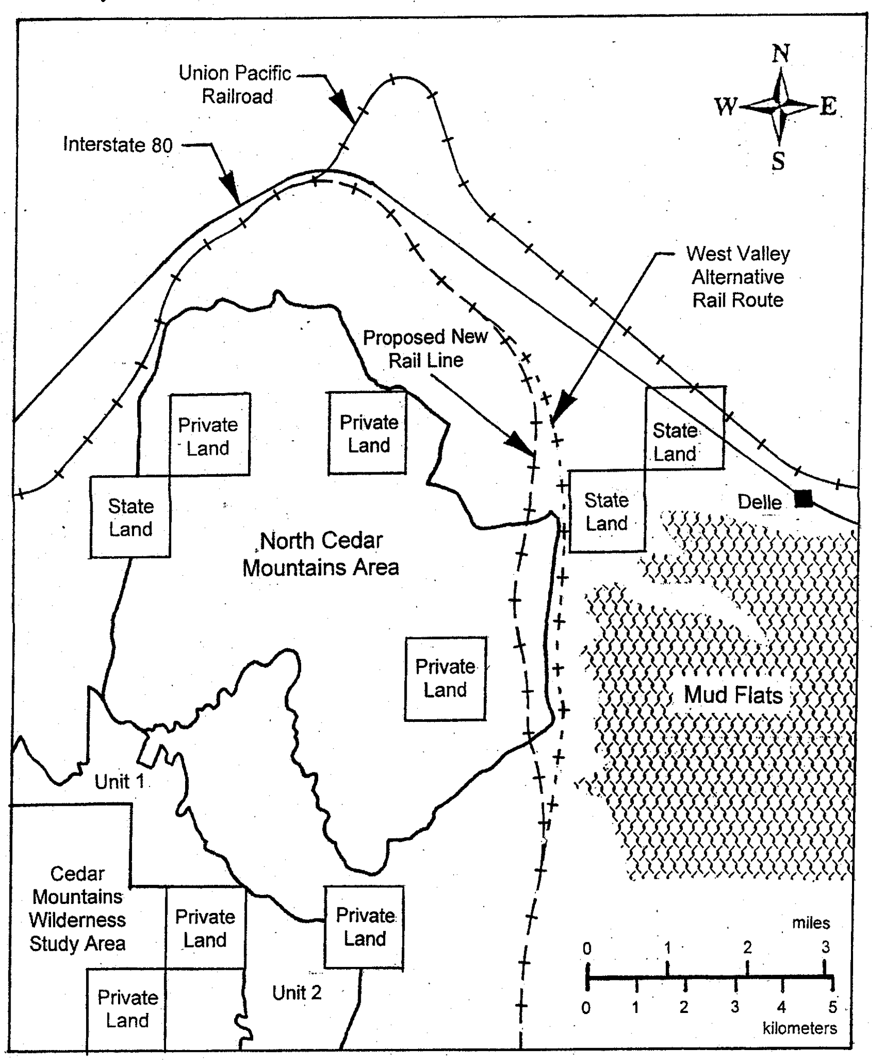


Figure 2.16. Alternative rail route/alignment near the northern end of the Cedar Mountains.

On May 7, 2001, a determination was made by BLM's Salt Lake Field Office Manager that the material provided by SUWA did not constitute significantly different information to warrant further review of the North Cedar Mountains wilderness values (at that time). This determination is not an appealable decision. To date, SUWA has not submitted additional proposals to BLM on the North Cedar Mountains area.

Based on the above evaluation, the NRC staff and the Cooperating Agencies conclude that the west valley rail alternative would result in greater environmental impacts, compared to the proposed rail route, due to increased excavation and cut and fill activities. In addition, the Cooperating Agencies have determined that the west valley rail alternative would not result in any significant reduction in impacts to recreation or wilderness characteristics of the adjacent land, when compared to the proposed route. Therefore, a more detailed evaluation of this alternative is not required.

Construction of an ITF and access road from Skunk Ridge or Delle, Utah. A new ITF, similar to the one described above, could be constructed at a location other than near Timpie. One possible location would be between Delle and Skunk Ridge. Construction of an ITF at such location would result in increased disturbance of historic transportation features, including U.S. 40.

Construction of an ITF and an associated road at Skunk Ridge would have similar construction impacts to those for the proposed rail line, and would include the additional excavation for the ITF itself. The new access road would follow the proposed rail line corridor. An ITF at Skunk Ridge would be located closer to Interstate 80, creating a greater visual intrusion than for a new rail siding at Skunk Ridge (as proposed by PFS).

Delle was also considered as a potential location for an ITF. An existing siding at Delle could be expanded to meet PFS's needs, with space available for location of the ITF facilities. There is an existing Interstate-80 underpass at Delle that could allow access to the south. The proposed road route from Delle (see Figure 2.17) would connect with the proposed rail line corridor and would follow the proposed rail corridor to the PFSF. This alternative would eliminate the extensive excavation required at Skunk Ridge, but would require crossing short sections of the mud flats located south of Delle and Interstate 80. This alternative ITF and access route would occupy areas that are currently utilized by recreationists and motorists southwest of Interstate 80.

Construction of a new ITF and an associated road from either Delle or Skunk Ridge would result in additional construction and maintenance impacts not associated with an ITF near Timpie, as well as operational impacts (such as additional radiological exposure from SNF handling) that would be avoided or reduced using transport on a new rail line through Skull Valley. Therefore, these alternatives were not evaluated in further detail in this FEIS.

2.2.5 No-Action Alternative

The no-action alternative would be not to build the proposed PFSF. Under the no-action alternative, there would be no lease with the Skull Valley Band, and the Skull Valley Band would be free to pursue alternative uses for the land in the northwest corner of the Reservation.

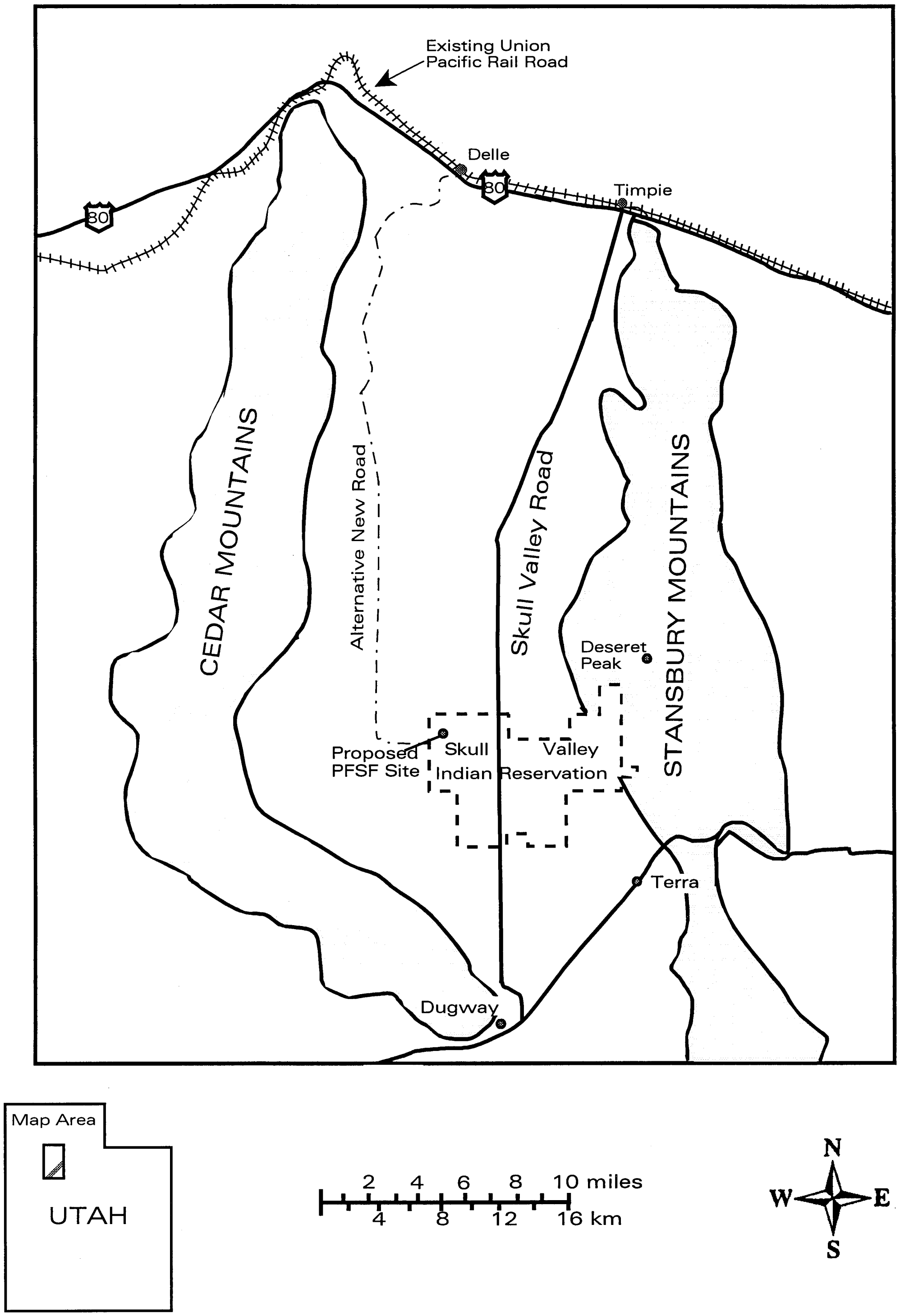


Figure 2.17. Alternative route for a new road in the western portion of Skull Valley.

Under the no-action alternative, no right-of-way approvals would be granted by the BLM and no amendments would be required for existing BLM Land Use Plans. The public lands administered by the BLM at the proposed ITF location near Timpie, as well as at the proposed Skunk Ridge rail siding location and along the proposed Skunk Ridge rail corridor would be available for other uses compatible with existing land use plans. Under the no-action alternative, STB would not approve construction of the proposed rail line.

Under the no-action alternative, NRC would not approve the license application to construct and operate the proposed PFSF. Nuclear power reactor licensees would continue to store SNF at their reactor sites in facilities such as SNF pools and/or at-reactor dry cask ISFSIs until the SNF can be shipped to a permanent geological repository.

In the absence of NRC license approval, there are several options that the PFS member or non-member utilities could pursue. At some reactor sites, the reactor licensees could expand the onsite storage capacity for SNF by constructing and operating at-reactor ISFSIs under a site-specific or general license, or, if possible, by expanding the capacity of their SNF pools. Some reactor licensees have already initiated or completed such expansions under their existing licensees and would be unable to expand further. Under this option, all SNF would be stored at existing sites until such time as a permanent geological repository or other storage facility becomes available. For other sites where expansion of onsite storage cannot be accommodated either economically or because of physical constraints, reactor licensees could propose developing a different ISFSI away from the reactor sites, or they would have to shutdown reactors before expiration of their operating licenses. In any event, under the no action alternative, SNF would continue to be stored at sites other than the proposed PFSF in Skull Valley, until such time as a permanent geological repository or another storage facility becomes available.

3. POTENTIALLY AFFECTED ENVIRONMENT IN SKULL VALLEY, UTAH

This chapter describes the existing natural resources and the environmental characteristics of Skull Valley, Utah. The descriptions provided in this chapter focus on the proposed location for the proposed PFSF on the Reservation, as well as on the location for the proposed new Skunk Ridge rail siding and rail corridor. A description of the location for the alternative ITF near Timpie is also included.

The information and data presented in this chapter provide a baseline description of the environment against which the various alternatives from Chapter 2 are evaluated in Chapters 4 and 5. The information presented in this chapter serves as the reference point against which the changes to the environment, both positive and negative, are assessed.

This chapter presents information on (a) geology, minerals, and soils, (b) water resources, (c) climate and air quality, (d) ecological resources, (e) socioeconomic and community resources, (f) cultural resources, (g) background radiological characteristics, and (h) other environmental features, including ambient noise levels, scenic qualities, and recreation.

3.1 Geology, Minerals, and Soils

This section provides a brief description of regional and local geology and identifies the characteristics of soils and mineral resources in Skull Valley. As described in Section 1.5.1, the NRC's process for reviewing the PFS license application includes an examination in a safety evaluation report of the ability of the facility's design to withstand earthquakes. The discussion of geology in this section of the FEIS is not intended to represent a detailed safety analysis of the facility's ability to resist seismic events. The NRC staff's review of the PFSF's seismic design is documented in the SER, as updated.

3.1.1 Geology

Skull Valley is located within a topographic valley about 35 km (22 miles) east of the Great Salt Lake Desert and about 80 km (50 miles) west of Salt Lake City. As shown in Figure 1.1, the valley is bounded on the east by the Stansbury Mountains, where Deseret Peak rises to a maximum elevation of over 3,300 m (11,000 ft) above sea level [or approximately 1,600 m (5,500 ft) above the valley floor]. The Cedar Mountains are located to the west of the valley and rise to elevations of approximately 2,300 m (7,700 ft) above sea level.

The proposed PFSF location lies within a sediment-filled structural basin in the eastern portion of the Basin and Range Province. This physiographic province is characterized by a roughly north-to-south trending series of fault-bounded, alternating ranges and basins. The eastern boundary of the Basin and Range Province is located at the Wasatch Front, about 90 km (55 miles) east of the proposed PFSF location. The Wasatch Front delineates the boundaries between the Great Basin to the west, the Colorado Plateau in southeastern Utah, and the Middle Rocky Mountains in northeastern Utah.

During the Miocene, Pliocene, and Pleistocene Epochs, normal faults west of the Wasatch Range uplifted and tilted large blocks of the earth's crust into the north-to-south-trending basin and range structures that exist today. The "range" portion of these structures include the Cedar and Stansbury Mountains while the "basins" include Skull Valley. To assist the reader, Table 3.1 identifies the various geologic periods.

The Wasatch Front is part of a distinct north-trending zone of elevated seismic activity which extends from northern Arizona to northwestern Montana. This 100-km (60-mile) wide by 1,300-km (800-mile) long zone has been identified as the Intermountain Seismic Belt (ISB) by Smith and Sbar (1974). The ISB encompasses a region which has experienced more than 15 recorded earthquakes with magnitude greater than 5.5, including one 7.1 magnitude event in 1959 at Hebgen Lake, Montana. The Skull Valley site lies at the western boundary of this region.

In Skull Valley, the top of bedrock occurs at depths ranging from 520 to 880 ft (PFS/SAR 2001) and is composed of Cambrian through Tertiary units (Geomatrix 1999). The Cedar Mountains are underlain by the Pennsylvanian Oquirrh Group (Hintze 1971). The Stansbury Mountains are underlain by the lower Cambrian Prospect Mountain Quartzite. Hickman Knolls, located about 1.6 km (1 mile) south of the proposed site, has been mapped as Fish Haven Dolomite of Ordovician age. Hickman Knolls is recognized as a dolomitic mega-breccia. About 1.6 km (1 mile) northeast of the site, a series of low hills (Castle Rock Knoll) have been mapped as Deseret Limestone of Mississippian age (Moore and Sorenson 1979).

Table 3.1. Geologic time scale

Era	Period	Epoch	Relevant formations	Age (millions of years)
Cenozoic	Quaternary	Holocene		0.1 to present
		Pleistocene	Lake Bonneville	1.6 to 0.1
	Tertiary	Pliocene		5.3 to 1.6
		Miocene	Salt Lake	23.7 to 5.3
		Oligocene		36.6 to 23.7
		Eocene		57.8 to 36.6
		Paleocene		66.4 to 57.8
Mesozoic	Cretaceous			144 to 66.4
	Jurassic			208 to 144
	Triassic			245 to 208
Paleozoic	Permian			286 to 245
	Carboniferous	Pennsylvanian		320 to 286
		Oquirrh Group		360 to 320
		Mississippian Deseret		
	Devonian			408 to 360
	Silurian			438 to 408
	Ordovician		Fish Haven	505 to 438
	Cambrian		Prospect Mountain	570 to 505

The valley is filled with more than 150 m (500 ft) of interbedded alluvial (stream) and lacustrine (lake) sediments that developed from alluvial fans from the bordering mountains or from ancient Lake Bonneville lacustrine deposition, respectively. Generally, alluvial deposits are coarser-grained near the margins of the adjacent mountains and become finer-grained as they extend toward the valley axis.

Valley fill sediments consist of Tertiary-aged siltstones, claystones, and tuffaceous sediments of the Salt Lake Formation unconformably overlain by Quaternary-aged lacustrine deposits. Particularly within the last 700,000 years, sedimentation in the valley was associated with fluctuations in the Bonneville Basin. Sediments from the most recent such fluctuations (from about 12,000 to 28,000 years ago) were associated with different lake stages of ancestral Lake Bonneville. The presence of two prominent paleosols (ancient soils) that developed between periods of lacustrine sedimentation were used for stratigraphic correlation of the uppermost sediments at the proposed site. A detailed physical and stratigraphic description of the basin fill sediments is presented in Geomatrix (1999).

3.1.2 Seismic Setting

The region has a long recorded history of seismic activity. Prior to the installation of a State-wide network of seismic stations in 1962, most records were based on anecdotal reports. PFS tabulates (PFS/ER 2001) 113 earthquakes that have occurred from 1850 to 1961. The largest measured historic earthquake that has occurred in the area was magnitude 6.6 in the northern end of the Great Salt Lake about 140 km (90 miles) north of the proposed PFSF site. This earthquake produced 50 cm (20 inches) of vertical ground displacement along a zone 12 km (7.5 miles) long (PFS/ER 2001). The closest magnitude 5.0 or greater earthquakes occurred about 67 km (42 miles) northeast of the site.

The Stansbury Fault, East Cedar Mountains Fault, and mid-valley faults (East, West, and Springline Faults; see Figure 3.1) are geologic structures that can contribute to the seismic hazard at the site. In the event of earthquake-induced displacement on one of the mid valley faults, displacement could be transferred to other mid-valley faults. Similarly, displacements originating in one segment of the Stansbury Fault or East Cedar Mountains Fault could be transferred to other segments. Details of both probabilistic and deterministic seismic hazard analyses and the effects of ground surface rupture resulting from an earthquake in Skull Valley are available in PFS's SAR (PFS/SAR 2001).

The NRC's SER, as updated, has evaluated the seismic setting of the proposed PFSF site. The SER concludes that two potentially capable fault sources are located within 11 km (7 miles) of the proposed site. Their closest approaches are estimated to be about 8.8 km (5 miles) for the East Cedar Fountain Fault and 10 km (6 miles) for the Stansbury Fault. The earthquake mean magnitude associated with these two faults would be 6.8 and 7.0, respectively (NRC/SER, as updated). The adequacy of the proposed PFSF to withstand earthquakes is addressed in the NRC's SER and is not addressed further in this FEIS; however, a summary of the findings of the seismic information from the SER is presented in Section 4.7.2.3 of this FEIS.

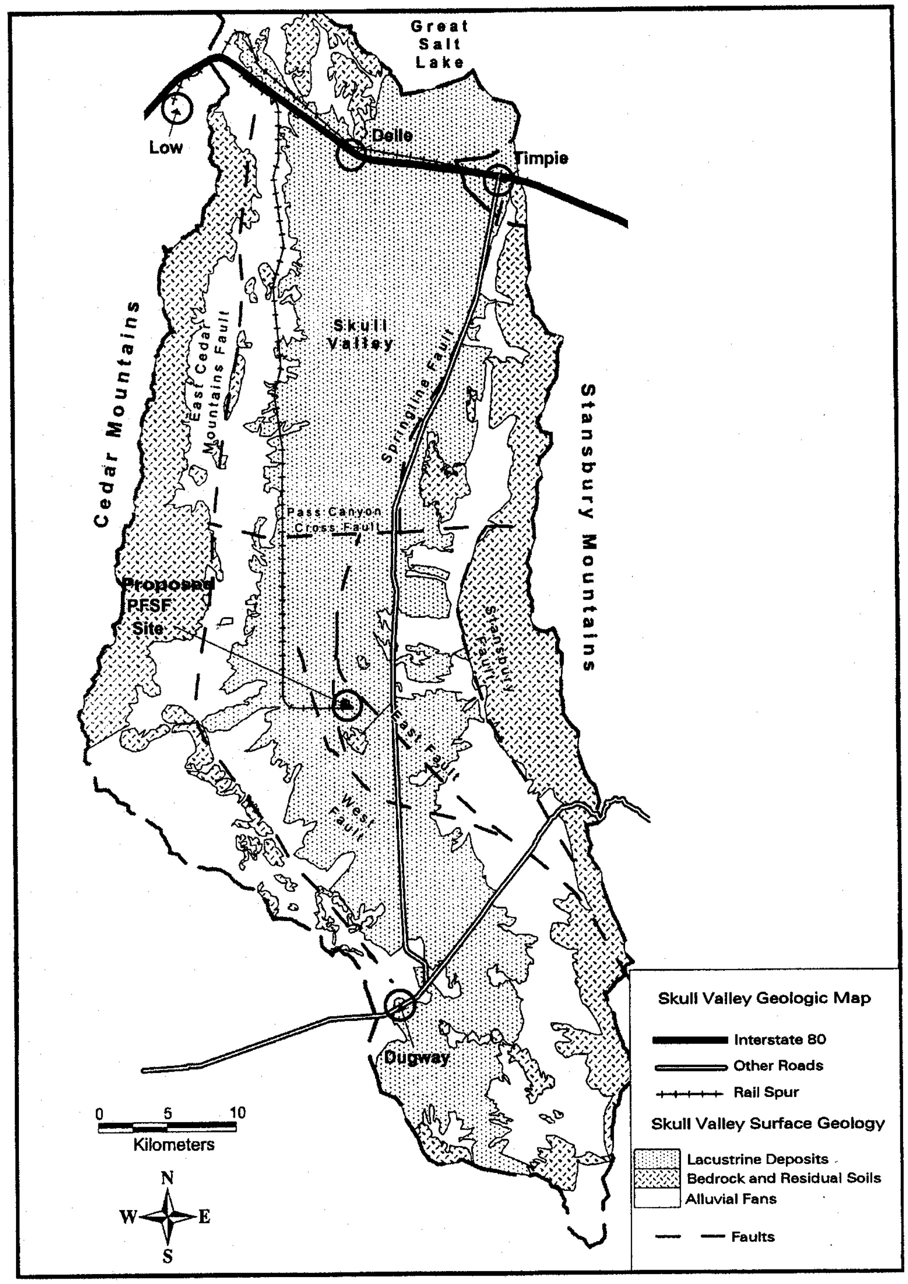


Figure 3.1. Mapped and interpreted surface and subsurface structural features in the immediate area of the proposed site. *Source:* Geomatrix Consultants, Inc. "Fault Evaluation Study and Seismic Hazard Assessment, Private Fuel Storage Facility, Skull Valley, Utah, (Project No. 4790)," Final report No. GMX-4790 (Revision 0), prepared for Stone and Webster Engineering Corporation, Denver, Colo., prepared by Geomatrix Consultants, Inc., San Francisco, Calif., February 1999.

3.1.3 Soils

Site subsurface materials consist of ancestral Lake Bonneville lacustrine (lake) and aeolian (windborne) deposits. Geomatrix (1999) describes thin [nominally 30 cm (1 ft) thick] soils from three test pits in the immediate area of the proposed action. Soils are described as both overlying and underlying aeolian deposits occurring within the upper 1 m (3 ft) of the subsurface. Organic content is reported to be low (no more than 20 percent to 30 percent) to nonexistent. Soils were generally not classified or identified by Geomatrix in the remaining 22 test pits located outside the immediate area of the proposed action.

In a series of test borings aligned east-to-west along the center of the proposed project area, Geomatrix (1999) describes an upper 0.6 to 1.2 m (2 to 4 ft) of silt and soil underlain by silty clay to depths of nominally 2.4 to 2.7 m (8 to 9 ft). Similar borings aligned east-to-west along the northern boundary of the proposed project area are described similarly in the PFS SAR. Water content of the silty clay materials varied from about 9 percent to more than 50 percent. The similarity of the descriptions in the two reports suggests that material occurrences are relatively uniform throughout the proposed action area, although the precise depths of occurrence may vary.

The following description is from information provided by Tooele County, Utah (W. Brodersan, Natural Resources Conservation Service, U.S. Department of Agriculture, Salt Lake City, Utah, personal communication to R. R. Lee, Oak Ridge National Laboratory, Oak Ridge, Tenn., February 17, 2000). The description begins at Skunk Ridge and progresses southward to the proposed PFSF site at the Reservation. Soils at the ITF site near Timpie are mapped the same as those at the proposed PFSF site, and their description is combined with that for the proposed site below. Because there is no abrupt or clearly-defined location at which the soil types change along the proposed rail route, only general descriptions are provided below.

Soils at the northern end of the new rail line are well-drained gravelly to very gravelly sandy loam with good roadfill characteristics. They are poor as sand and gravel resources because of excess fines, and also poor as topsoil because of the abundance of small stones. Permeability is moderately rapid [5 to 15 cm/hr (2 to 6 inches/hr)] with a low shrink-swell potential. Organic content is between 0.5 and 1 percent. Water erodibility is low, while wind erodibility is moderate.

Further south along the proposed rail corridor, these soils change to a fine sandy loam. They are improbable as sand and gravel resources because of excess fines and fair to poor as topsoil because of excess salt and small stones. Permeability is moderately rapid [5 to 15 cm/hr (2 to 6 inches/hr)] with a low shrink-swell potential, and pH varies from 7.9 to 9.0. Organic content is between 0.5 and 1 percent. Water erodibility is moderate, and wind erodibility is high.

Soils along the southern-most portions of the proposed rail line and at the preferred site (Site A), the alternative site (Site B), and the ITF site near Timpie are a silty clay loam. They are improbable as sand and gravel resources because of excess fines, poor for topsoil because of excess salt, and poor for roadfill because of their low strength. Permeability is moderately slow [0.5 to 1.5 cm/hr (0.2 to 0.6 inches/hr)], and the soils have a low to moderate shrink-swell potential. Organic content varies from 0 to 1 percent, and pH varies from 7.9 to 9.0. Erodibility to both water and wind is moderate.

3.1.4 Mineral Resources

The State of Utah and the Basin and Range Province have abundant mineral resources. Bon (1995) reports the presence of eleven large mine permits and plants in Tooele County including gold and silver, building stone, industrial minerals, and salt. Of these, the closest to the proposed PFSF site is a 5-ha (12-acre) surface quarry of aragonite dimension stone located about 10 km (6 miles) south of Low in the Cedar Mountains. Slightly further south and on the western flank of the Cedar Mountains, Tripp et. al. (1989) report the presence of several limestone and dolomite quarries and one iron prospect near Hastings Pass. Tripp et. al. (1989) also report a small prospect of unidentified material located about 3 km (2 miles) southeast of Horseshoe Springs, two small iron claims about 13 km (8 miles) southeast of Horseshoe Springs, and another small iron prospect immediately north of the Reservation at the foot of the Stansbury Mountains. Numerous small claims of unidentified commodities and one small multi-metal claim are also reported by Tripp et. al. (1989) to be near the foot of the Stansbury Mountains southeast of the Reservation and adjacent to a small silica sand deposit located on the eastern edge of the valley about 13 km (8 miles) northeast of Dugway. Tripp et. al. (1989) report a very large sand and gravel resource in the Tooele quadrangle while lacustrine deposits are the chief resources that contain large quantities of high-quality aggregate.

Gloyn (1999) reports the potential for shallow mineral deposits in the immediate vicinity of the proposed site and surrounding area. The most likely mineral types are copper with the potential for surrounding lead-zinc-silver or gold-silver. Minor but numerous lead-zinc-silver, iron, copper-silver, and arsenic-antimony-silver mines and prospects are noted in the adjacent Cedar and Stansbury Mountains. Several similar suspected gold or silver claims are also noted in Skull Valley. Most of the claims in both the valley and adjacent mountains are reported by Gloyn (1999) to have lapsed, suggesting a past but discontinued interest in the area at present.

BLM (1999) reports five existing sand and gravel pits and six oil and natural gas leases in or near the proposed action area. Two active mining claims are identified on the eastern flank of the Cedar Mountains, and the entire length of Skull Valley has been identified as prospectively valuable for oil and gas minerals. Much of the valley north of the proposed site is also prospectively valuable for geothermal resources.

PFS has identified five commercial sources of construction materials between 10 and 77 highway km (6 and 48 highway miles) from the proposed PFSF site (see Figure 3.2). These five sites are described in Table 3.2. All of the sites in Table 3.2 are on private land.

3.2 Water Resources

3.2.1 Surface Water Hydrology and Quality

3.2.1.1 General Site Setting

The proposed PFSF in Skull Valley (see Figure 1.1) would be located approximately 39 km (24 miles) south of the present shoreline of the Great Salt Lake. In the Late Pleistocene Epoch (see Table 3.1), Skull Valley was inundated by Lake Bonneville, the predecessor of the existing Great Salt Lake.

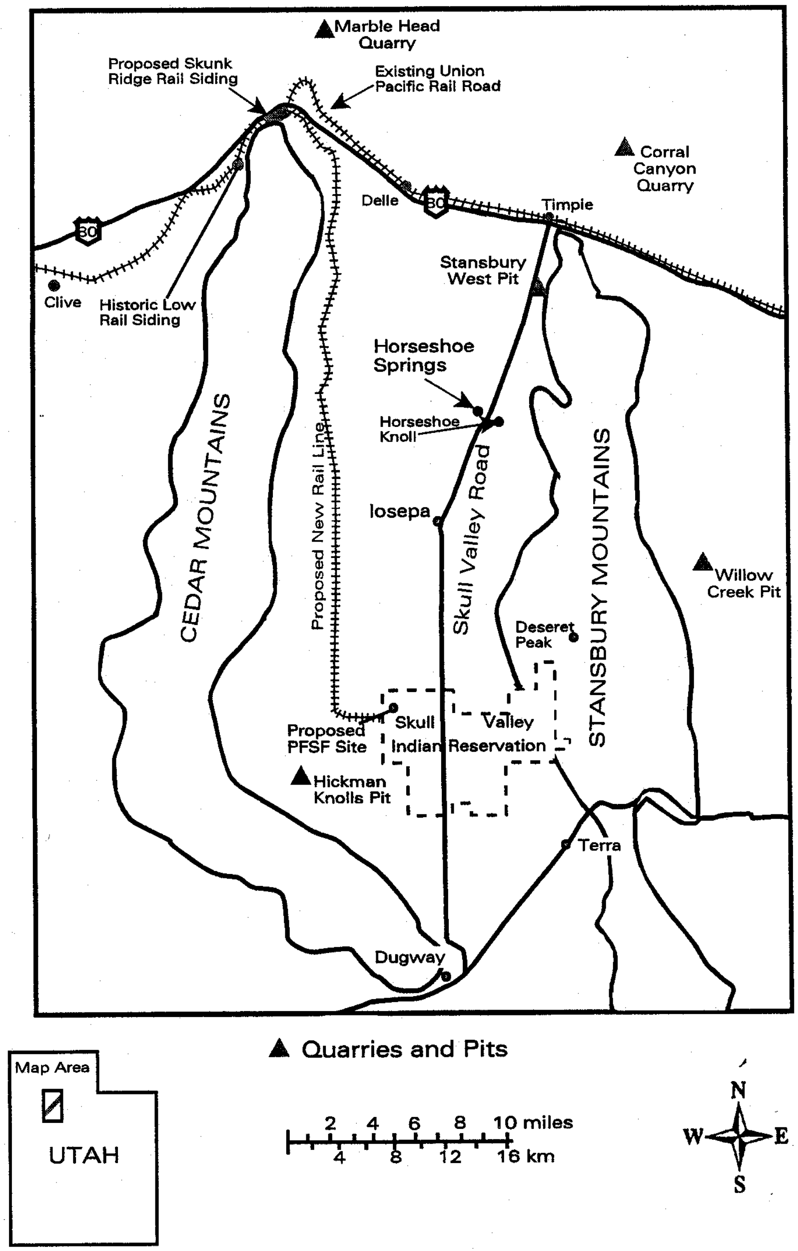


Figure 3.2. Locations of potential sources of construction aggregate in Skull Valley.

Table 3.2. Types of construction materials and their quantities available in the vicinity of Skull Valley

Type of material	Site 1	Site 2	Site 3	Site 4	Site 5	Total
Sand	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Crushed rock (1")	164,000 m^3 (214,000 yd^3)	137,000 m^3 (179,000 yd^3)	164,000 m^3 (214,000 yd^3)	NA	NA	465,000 m^3 (607,000 yd^3)
Small road base ($\leq$1")	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Large road base (approx. 1.5")	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Structural fill material (1½" minus)	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Common fill	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Sub-ballast	109,000 m^3 (143,000 yd^3)	82,000 m^3 (107,000 yd^3)	109,000 m^3 (143,000 yd^3)	NA	NA	300,000 m^3 (393,000 yd^3)
Ballast	NA	NA	NA	219,000 m^3 (286,000 yd^3)	219,000 m^3 (286,000 yd^3)	438,000 m^3 (572,000 yd^3)

Site 1: The Stansbury West Pit, approximately 27 km (17 miles) north of the proposed PFSF site.
Site 2: The Hickman Knolls Pit, approximately 10 km (6 miles) west of the proposed PFSF site.
Site 3: The Willow Creek Pit, approximately 77 km (48 miles) north-east of the proposed PFSF site.
Site 4: The Corral Canyon Quarry, approximately 61 km (38 miles) north-northeast of the proposed PFSF site.
Site 5: The Marble Head Quarry, approximately 56 km (35 miles) north of the proposed PFSF site.

Note: Distances reported to the five sites above are highway/road miles.

Figure 3.3 shows the locations of drainage channels, springs, and surficial geology/soil. Annual precipitation in Skull Valley ranges from 18 to 30 cm (7 to 12 inches) while the adjacent Stansbury mountains receive up to about 100 cm (40 inches) and the Cedar Mountains receive 40 to 51 cm (16 to 20 inches) of precipitation (PFS/ER 2001). Based on data collected between 1997 and 1998, approximately 26 cm (10.2 inches) of precipitation fell annually at the site. Much of the precipitation falls as snow. Snowmelt provides flow in streams, most of which are intermittent, that drain the mountains.

Local drainage features are poorly developed dry washes [<0.3 to 0.66 m (<1 to 2 ft deep)] that may carry flows temporarily during spring snowmelt or during infrequent summer thunderstorms. Because of the arid climate and geologic conditions in and around the mountains, most of the runoff from the mountains either evaporates or infiltrates into alluvial materials near the margins of Skull Valley. Infiltration of runoff from the mountains recharges aquifers in the alluvial fans that extend beneath Skull Valley. There are few perennial streams in Skull Valley and none near the site of the proposed PFSF.

The total watershed area of Skull Valley is approximately 1,800 km^2 (446,000 acres). Surface water runoff generally drains from south to north into the Great Salt Lake. The proposed site is located on the northern toeslope of Hickman Knolls, a rocky outcrop near the center of the valley. Hickman Knolls and the slightly elevated land surface around the base of the knolls form an area of high ground in the valley. The proposed PFSF site is located on this slightly elevated portion of the Skull Valley floor. The local topography is comprised of a series of north-trending shallow washes that carry surface runoff from the site and upslope areas to the south near the knolls.

The proposed site location is on an upland area that forms a drainage area boundary between the main axis of Skull Valley and a southwestern drainage area that drains a portion of the Cedar Mountains (see Figure 3.3). The drainage basins, as described below, were determined during the flood analysis conducted as part of the NRC staff's safety review (see NRC/SER). The site is centrally located in the watershed, with 48 percent of surface drainage area upstream and 52 percent downstream. About 700 km^2 (173,000 acres) of drainage basin lie to the south (upstream) of the proposed PFSF site in the main upstream watershed area, approximately 165 km^2 (41,000 acres) lie upslope to the southwest toward the Cedar Mountains, and approximately 948 km^2 (234,000 acres) lie downstream of the site toward the Great Salt Lake.

There are no perennial lakes or ponds within 8.5 km (5 miles) of the proposed PFSF site or along the proposed Skunk Ridge rail corridor other than a few stock ponds or small reservoirs used to store irrigation water (PFS/ER 2001). There are no public or private surface water sources used for human consumption in Skull Valley.

The stream nearest to the proposed PFSF site is Indian Hickman Creek, (see Fig. 1.2), which flows westward from the Stansbury Mountains onto the Reservation. This creek is over 6.5 km (4 miles) from the proposed PFSF site. It feeds the Reservation's water supply reservoir. Indian Hickman Creek originates from springs in the mountains and has recorded flowrates at the Reservation boundary of 70 to 90 L/s (2.5 to 3.1 ft^3/s) from April 6 to June 5.

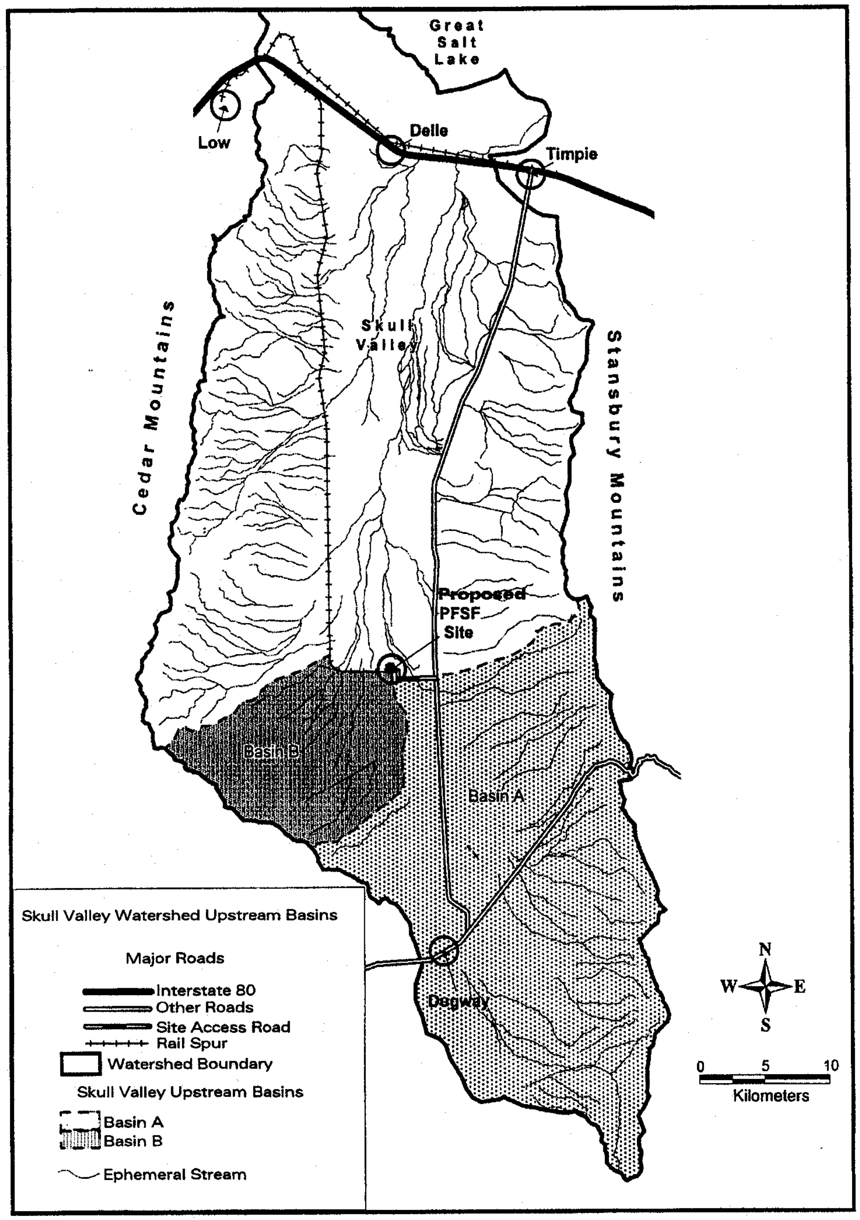


Figure 3.3. Drainage channels and soils/surficial geology in Skull Valley.

The stream channel feature nearest to the proposed site is approximately 500 m (1,500 ft) to the northeast, is up to 1 m (3 ft) deep, and is 2 to 2.5 m (6 to 8 ft) wide in places (PFS/ER 2001). No flow was observed in this channel during the observation period of June 1996 through February 1997 (PFS/ER 2001). The nearest perennial surface water flow downstream of the proposed PFSF site is Horseshoe Springs located 16 km (10 miles) to the north (PFS/ER 2001).

3.2.1.2 Flooding

The potential for site flooding is summarized in this EIS. The details of the flooding analysis performed for the PFSF site can be found in NRC staff's SER.

Flooding is an extremely rare event in the Skull Valley area. The proposed site lies on an elevated drainage basin boundary on the northern toeslope of Hickman Knolls. The direct upslope drainage area that would generate overland flow onto the site between Hickman Knolls and the site is approximately 260 ha (640 acres). Access routes to the proposed site, including the access road from Skull Valley Road to the Skunk Ridge rail corridor, cross other areas with larger upslope drainage areas. After heavy rainfall or snowmelt, surface runoff in the normally dry washes in the vicinity of the proposed site and access routes could exceed the channel capacities and flooding could occur. During 1982 and 1983, much of the State of Utah experienced unusually high annual precipitation [i.e., 38 cm (15 inches) and 33 cm (13 inches), respectively, compared to an annual average of 20 cm (7.7 inches)]. Adverse effects on the stability of Skull Valley Road were noted. According to Kaliser (1989), Skull Valley Road was softened sufficiently that two heavy transport carriers were adversely affected. One vehicle sank into the asphalt, presumably because of softening of road fill under the pavement, and the other overturned. It is not apparent that substantial improvements have been made to Skull Valley Road to prevent similar occurrences.

As described in the previous section, the upstream area that could contribute runoff to potential floods is subdivided into two basin areas–Basin A, and Basin B (NRC/SER). Basin A includes approximately 700 km^2 (173,000 acres) of southernmost Skull Valley. Basin B includes approximately 165 km^2 (41,000 acres) of runoff area to the south of the PSF site. The Basin A dry stream channel approximately 500 m (1,500 ft) northeast of the site would carry floodflows from an upstream basin area of approximately 700 km^2 (173,000 acres). The minor drainage channels that exist on the site would be supplied by sheet flow from the area south of the site to Hickman Knolls during extreme rain events.

The normal elevation of the Great Salt Lake is about 1281 m (4203 ft). In 1986, the Great Salt Lake flooded to a recent high level of 1283.8 m (4211.85 ft) above sea level. Planning documents issued by the State of Utah Department of Natural Resources in January 1999 have designated the floodplain elevation of the Lake as 1284 m (4212 ft) for planning purposes and 1285 m (4217 ft) as the extent of the Lake's historic floodplain.

Components of the proposed PFSF project for which flood impact has been reviewed include the facility, the site access road from Skull Valley Road, and the rail line access route. Flooding impacts are discussed in Sections 4.2 and 5.2.

3.2.2 Groundwater Hydrology and Quality

Groundwater flows generally northward in Skull Valley toward the Great Salt Lake. Groundwater in the region is generally recharged in the mountains and alluvial aprons on their flanks adjacent to the valleys. Springs occur in a number of settings in Skull Valley. Some springs shown on area maps occur in bedrock areas in the mountains, some occur in alluvial aprons or near the axis of Skull Valley, while others occur on or near the outcrop of faults. The Springline Fault (as shown in Figure 3.1) is a major geologic feature in the eastern portion of Skull Valley. Several prominent springs in Skull Valley—including Big Spring, Burnt Spring, Muskrat Spring, and Horseshoe Spring—occur along the outcrop of the Springline Fault. (See Section 3.4.2.2 and Figure 3.8 for additional information about these springs.)

Skull Valley is a typical Basin and Range valley that contains a thick accumulation of sediment derived from erosion of the adjacent mountain ranges. The best source of groundwater in Skull Valley in terms of both quantity and quality is the alluvial aquifer along the eastern edge of the valley that receives recharge from streams that drain the Stansbury Mountains. Toward the center of Skull Valley, the Salt Lake Group of Tertiary age (see Table 3.1) comprises the majority of the valley fill and ranges in thickness from 600 m to more than 1,800 m (about 2,000 to 6,000 ft) (PFS/ER 2001).

The Salt Lake Formation is estimated to be approximately 150 to 245 m (500 to 800 ft) thick at the site (PFS/ER 2001). Subsurface investigations performed on the site encountered approximately 6 to 9 m (20 to 30 ft) of fine-grained deposits of clayey silts and silty clays the overlie fine sand that contains interbeds or zones of silty to clayey materials with small amounts of sand. Data are not available to fully define the soil hydraulic properties under saturated or unsaturated conditions however some basic soil moisture content and re-worked soil moisture properties data (Atterberg limits) are available. Soil test data for numerous soil samples obtained within the upper 10 m (33 ft) show that most of the soils are fairly dry with natural moisture contents near the lower end of the plastic range for the silty clays and clayey silts (PFS/SAR 2001; Appendix 2A). This condition is indicative that in addition to the direct percolation of water through the soil column the site soils have the capacity to absorb some infiltrating moisture prior to reaching a state of saturation.

Of the numerous borings performed on site for geotechnical purposes, two borings were advanced to depths greater than about 30 m (100 ft) on site. One of these borings was advanced to a total depth of 47 m (154 ft) and encountered groundwater at a depth of 38 m (124.5 ft). The elevation of groundwater encountered in this boring (4350 ft) is slightly higher than the level estimated for this part of Skull Valley by Hood and Waddell (1968). The other deep boring was advanced to a total depth of 69 m (226.5 ft) and soils below the 38 m (125 ft) depth were noted as damp or wet with only one notation of saturated soils at the 47 m (155 ft) depth. No groundwater table was documented on the boring log.

Seismic reflection surveys were performed on the site as part of geotechnical characterization studies and three profiles provide information on the elevation of the top of the saturated zone (groundwater table) beneath the site (PFS/SAR 2001; Appendix 2B). These data are considered less reliable than direct water level observations made in onsite borings or wells because the interface resolution may not be precise in areas with a variable capillary fringe above the water table or where subsurface material properties result in seismic energy returns similar to those of saturated soils. The saturated zone surface information derived from the geophysical interpretation is useful as a basis of comparison with the limited available well data. Two profiles were performed in a cross pattern centered on the storage pad area and the third was performed near the access road and administration building area. In north-south profile the top of saturated materials interpreted in the seismic reflection profiles is an undulating surface that is generally higher 1332 m (4370 feet) near the southern end of the pad area and lower 1322 m (4335 ft) near the northern end of the pad area. The southernmost end of the profile suggests the potential for a local groundwater seepage gradient to the south toward Hickman Knolls. In east-west profile it appears that the top of the saturated interval is highest (4377 ft) near the eastern edge of the pad area, with a broad low region 1328 m (4355 ft) beneath the center of the site and a slightly elevated saturated surface level 1329 m (4360 ft) near the western edge of the pad area. This overall saturated zone surface configuration would indicate that most of the groundwater movement beneath the site would be toward the center of the site and then northward. The third profile is located southeast (upslope) of the pad area and the inferred top of saturated materials may occur from approximately 1366 m (4480 ft) near the administration area to approximately 1328 m (4355 ft) to the east along the site access road.

In Skull Valley groundwater is supplied from unconsolidated or semi-consolidated sediments that formed from alluvial fan deposits. Recharge to the area groundwater system is mainly from infiltration and snow melt runoff on the Stansbury Mountains. The alluvial aquifer along the eastern edge of the valley is recharged by stream infiltration and direct recharge through the coarse-grained soils of the coalesced alluvial fans. Surficial soils in the alluvial fans have relatively high infiltration capacities [5 to 15 cm/hr (2.0 to 6.0 inch/hr)] as described in Section 3.1. The reported infiltration capacity of soils in Skull Valley is 0.5 to 1.5 cm/hr (0.2 to 0.6 inch/hr) which is equivalent to a saturated hydraulic conductivity of 1.4×10^{-4} to 4.2×10^{-4} cm/sec. One published reference (Hood and Waddell, 1968) states that in Skull Valley little or none of the precipitation that falls on lands below 1616 m (5,300 ft) reaches the groundwater reservoir because the average annual amount of precipitation (the natural source of recharge) is small and because the surficial or near-surface deposits are silt and clay that have low permeability and inhibit downward percolation of water. Localized induced recharge could occur beneath ponds or continually saturated areas if sufficient excess water is available or through natural or man-made permeable pathways beneath water ponding areas. Seasonal perched groundwater and semi-confined ground water can be found in valley fill sand and gravel deposits that are overlain by lacustrine silt and clay deposits although none were noted in boring logs for the PFS project.

The regional water table hydraulic gradient beneath the floor of Skull Valley is about 9.5×10^{-4} to the north toward the Great Salt Lake (PFS/ER 2001). The local hydraulic gradient beneath the site estimated from the top of the saturated zone described above, may be as much as 2.5×10^{-2} to the north. The hydraulic conductivity of the water-bearing zone (determined from a test performed in one onsite well) is approximately 5.0×10^{-5} cm/sec (2.0×10^{-5} inch/sec) (PFS/ER 2001). Based on the estimates for hydraulic parameters at the PFS site the apparent groundwater seepage velocity beneath the site would be approximately 1.2×10^{-6} cm/sec (1.04 m/day). If a saturated zone porosity of 0.3 is assumed, the actual seepage velocity would be approximately 3.9×10^{-6} cm/sec (3.5 m/day). No site-specific hydraulic conductivity test data are available for materials above the water table. Based on available reported surface material infiltration rates and the onsite hydraulic conductivity test result, the hydraulic conductivity profile at the PFS may consist of higher permeability materials overlying lower conductivity material—a condition in which excess water at the land surface could infiltrate to the underlying water table.

Hood and Waddell (1968) have estimated that annual groundwater recharge and discharge are on the order of 3.7×10^{7} to 6.2×10^{7} m^3 (30,000 to 50,000 acre-ft) with evapotranspiration accounting for 80 to 90 percent of discharge. They also estimate that approximately 9.9×10^{5} m^3/yr (800 acre-ft/yr) underflow out of the valley, presumably to the north. Approximately 6.2×10^{6} m^3/yr (5,000 acre-ft/yr) of groundwater is withdrawn for domestic and agricultural uses.

Groundwater in the alluvial apron along the base of the Stansbury Mountains contains the lowest total dissolved solids (TDS) in the valley, with concentrations from 100 to 800 mg/L. Groundwater can be obtained from the Salt Lake Formation in some areas near the center of Skull Valley although the TDS content increases toward the center and northern end of the basin. TDS levels between 1,000 and

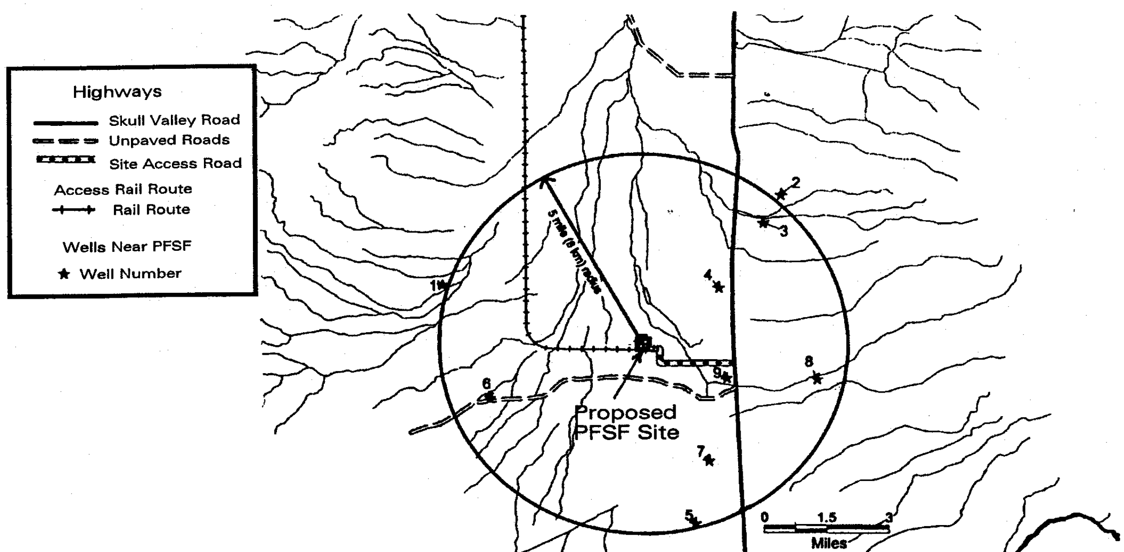
10,000 mg/L have been reported in the central and northern part of Skull Valley (PFS/ER 2001). Sodium and chloride are the principal ions that contribute to elevated TDS in the basin.

3.2.3 Water Use

Water rights in Utah have been described as follows: "All waters in Utah are public property. A water right is a right to the use of water based upon (1) quantity, (2) source, (3) priority date, (4) nature of use, (5) point of diversion, and (6) physically putting water to beneficial use. The Utah pioneers in the late 1840s were the first Anglo-Saxons to practice irrigation on an extensive scale in the United States. Being a desert, Utah contained much more cultivable land than could be watered from the incoming mountain streams. The principle was established that those who first made beneficial use of water should be entitled to continued use in preference to those who came later. This fundamental principle was later sanctioned and is known as the Doctrine of Prior Appropriation. This means those with earliest priority dates who have continuously used the water since that time have the right to water from a certain source before others with later priority dates" (Excerpted from http://nrwrt1.nr.state.ut.us/wrinfo/default/htm, as accessed on 12/4/00). The Reservation was established by Executive Orders of September 7, 1917 (17,920 acres), and February 15, 1918 (640 acres). At the time the Reservation was established, the doctrine of Federal reserved water rights operated to reserve from then–unappropriated sources of water appurtenant to the Reservation an amount necessary to fulfill the purpose of the Reservation. The water rights reserved with establishment of the Reservation assures for the Skull Valley Band the amount of water needed to irrigate practicably irrigable acreage, maintain fisheries, and supply domestic, municipal, and industrial needs.

Sources of potable water for the Reservation and scattered ranches are wells drilled into unconsolidated or semi-consolidated sediments that form the alluvial fan along the toe of the Stansbury Mountains to the east of the proposed PFSF site. Indian Hickman Creek originates in the east of the Skull Valley Reservation on the Wasatch National Forest and flows in a westerly direction onto the Reservation. A pipeline carries water from Indian Hickman Creek to a small reservoir located near the Skull Valley Village. The reservoir stores less than 5 acre-feet of water and approximately 3 acres of land is irrigated with water diverted from Indian Hickman Creek on the Reservation. No surface water in Skull Valley provides private or public drinking water.

Water use in the valley is estimated at 6.2×10^6 m^3/yr (5,000 acre-ft/yr) (PFS/ER 2001). Seven wells are known to extract groundwater for domestic or stock watering purposes within an 8 km (5 mile) radius of the center of the PFSF site. Three of those 7 wells are owned by members of the Skull Valley Band and are not reflected in available records from the State of Utah. Assuming all wells are used to the limit of the applicable water rights, the estimated groundwater withdrawals within the 8 km (5 mile) radius of the site are approximately 1.9 × 106 m^3/yr (1600 acre-feet/yr). Figure 3.4 shows the locations of these wells and indicates ownership and water rights. The well nearest to the site is located approximately 3.2 km (2 miles) away.



Well Map No.	Owner	Total Depth (feet)	Date Drilled	Use	Depth to Water Before Pumping (feet)	Yield When Well Drilling Was Completed (gal per min)	Priority/Allowed Diversion
1	Skull Valley Co., Ltd.	340	1967	Stockwatering	297	No Data	0.015 cfs 1955
2	Island Ranching Co., Inc.	325	1959	Irrigation, Stockwatering	No Data	765	2.18 cfs 1959
3	Island Ranching Co., Inc.	347	1954	Irrigation, Stockwatering	168	No Data	1.226 cfs 1954
4	Auschutz Land Company	408	No Data	Irrigation, Stockwatering	No Data	No Data	0.7487 cfs 1960
5	Auschutz Land Company	209	1948	Stockwatering	150	20	0.015 cfs 1948
6	Auschutz Land Company	292	1940	Stockwatering	280	12	0.015 cfs 1940
7	Skull Valley Indian Reservation	401	1975	Domestic, Industrial	77.5	15	Not Required
8	Skull Valley Indian Reservation	651	1976	Domestic	519.5	60	Not Required
9	Skull Valley Indian Reservation	No Data	No Data	Domestic	No Data	No Data	Not Required

Figure 3.4. Locations of water wells within 8 km (5 miles) of the proposed PFSF.
Note: 1 ft = 0.3048 m, 1 gpm = 3.78541 L/min, 1 cfs = 28.3169 L/sec.

PFS has made inquiry of persons familiar with water quantities and usage in the Skull Valley area and has reported that three permitted wells within a 24 km (15 mile) radius of Low, Utah, are capable of producing 1,510 m^3/day (400,000 gal/day) each. Current withdrawal of water from those wells is less than half the permitted quantity (PFS/RAI3 2000).

Groundwater uses in Skull Valley include domestic use, livestock watering, and irrigation. Wells are normally completed to depths of at least 33.5 m (110 ft) below ground surface in the unconsolidated alluvial deposits on the east side of the valley where water quality is best. The community well for the Skull Valley Band (well no. 8 in Figure 3.4) is about 6 km (4 miles) from the proposed PFSF site.

3.3 Climate and Air Quality

3.3.1 Climate

The broad regional characteristics of the climate of Skull Valley can be described using data from the Salt Lake City International Airport (SLCIA), which has longer records of more meteorological variables than does any other station within 160 km (100 miles). Records for most variables extend back before 1950. However, SLCIA is 80 km (50 miles) northeast of the site of the proposed PFSF, and SLCIA is more strongly influenced by the Great Salt Lake, which is about 5 km (3 miles) to its northwest.

Records at Dugway, about 19 km (12 miles) south of the proposed PFSF site, extend back to 1950 but do not include all the variables recorded at SLCIA. The monitoring station nearest to the proposed PFSF site is located near the Pony Express Convenience Store, about 3.5 km (2.2 miles) southeast of the site, at the closest topographically similar location having access to an AC power source; these data are usually called the “on-site data” in environmental documents relevant to the proposed PFSF. Only two years (1997 and 1998) of such on-site data are available, making the record highly subject to climatic variability of either year. Based on comparisons of the data sets with each other, and with other nearby data from Tooele Army Depot, both sets of data are believed to be generally accurate representations of on-site conditions, and both are used in this FEIS so as to maximize the amount of useful data included in the analysis.

The climate of Skull Valley reflects its mid-latitude continental-interior location; summers are hot and winters are moderately cold. Temperatures at SLCIA rise above 32°C (90°F) on more than half (58 percent) of the days in summer (June through August), and minimum temperatures reach below freezing on about 80 percent of the days in winter (December through February); however, extreme temperatures of −18°C (0°F) or lower only occur on an average of 3 days per winter. The mean January temperature at SLCIA is −2.2°C (28°F); the mean July temperature is 25°C (77°F). Meteorological records for Dugway give the mean January temperature as −2.8°C (27°F), and the mean July temperature as 25.5°C (78°F) (Western Regional Climate Center 1999). The two-year record of on-site data indicates an average January temperature of −0.5°C (31°F) and an average July temperature of 23°C (74°F).

Distance and mountain barriers between Skull Valley and a large source of moisture (i.e., the Gulf of Mexico or the Pacific Ocean) produce a dry climate. Annual average precipitation at Dugway since 1950 has been approximately 20 cm (8 inches), about one-third of which [6.6 cm (2.6 inches)] occurs during the spring months (March, April, and May), with the other two-thirds evenly distributed among the remaining three seasons. The two-year on-site record indicates approximately 26 cm (10.2 inches) of precipitation fall annually. Although the presence of the Great Salt Lake leads to increased precipitation just to the south and southeast of the lake, especially during the winter and spring months when winds are from the north and northwest, the lake's effect on climate at the site of the proposed PFSF is very small.

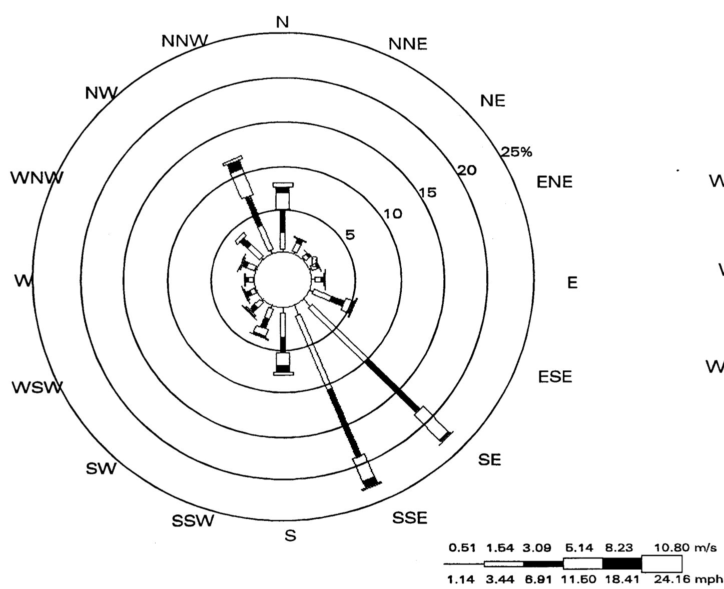
Because dry air allows more heat to escape upward at night, the difference between daily maximum and minimum temperatures is larger than in relatively moist locations. In summer the area receives over 80 percent of the possible amount of sunshine (Wood 1996), and clouds are scarce; this effect further increases the daily temperature range. The July minimum and maximum temperatures average 16°C (61°F) and 34°C (94°F) respectively (Western Regional Climate Center 1999). January mean daily minimum and maximum temperatures at Dugway average −8.3°C (17°F) and 3.3°C (38°F) respectively.

Seasonal variations in relative humidity are large; during the winter, the influence of the Great Salt Lake can provide enough moisture to raise the relative humidity to an average of about 70 percent during daylight hours and about 80 percent during the night at SLCIA, located just to the south-southeast of the Great Salt Lake, where fog occurs on an average of four days per month during winter (Wood 1996). Because Skull Valley is further from the Great Salt Lake and not in a direction of prevailing winds passing over the lake, fog occurrences in Skull Valley would be expected less frequently than at the airport; however, there are no fog data from Skull Valley available for comparison. During summer, when relative humidities at Salt Lake City average around 25 percent during the day and 50 percent at night, fog rarely occurs.

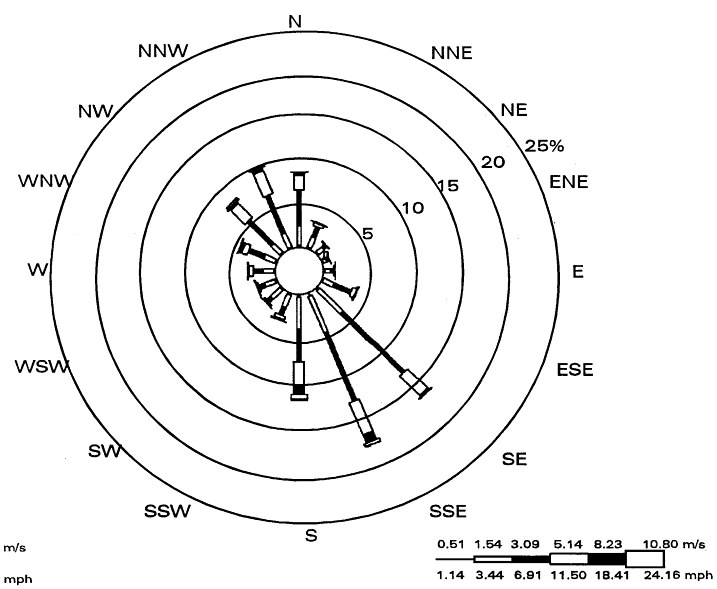
The height above ground to which appreciable vertical atmospheric mixing occurs (the mixing height) is an important factor influencing atmospheric dispersion of pollutants. If mixing height and wind speed are both very low, atmospheric dispersion of pollutants is limited and concentrations of pollutants in a plume originating at any particular source will tend to remain high. Average morning mixing heights over Salt Lake City range from 219 m (719 ft) in the summer to 419 m (1,375 ft) in the spring; these values are lower than for most areas in the United States. Average afternoon mixing heights range from 945 m (3,100 ft) in winter to 3,737 m (12,260 ft) in summer; these values are higher than for most areas in the United States (Holzworth 1972). Because surface temperature is related to mixing height in many meteorological situations, the wide diurnal range of temperature in the region is associated with a correspondingly wide diurnal range of mixing heights.

Winds in the region tend to be aligned with the mountain ranges. Data from the SLCIA indicate that prevailing winds in the area are from the south-southeast or north-northwest; recent (1997–1998) wind data from the Pony Express convenience store, about 3.5 km (2.2 miles) from the site of the proposed PFSF, are in general agreement with the SLCIA data (Figure 3.5). Average annual wind speed is 8.8 mph at the airport and 8.7 mph at the on-site monitoring station.

Extreme wind speeds are often given in terms of a "fastest mile," which is the average speed of the air measured over the time interval it would take the air to travel 1 mile at that speed. For example, a fastest mile of 60 mph implies that an average wind speed of 60 mph was measured over a 60-sec



Pony Express Convenience Store



Salt Lake City, 1984 - 1991

Figure 3.5. Wind roses for Salt Lake City and for the location near the Pony Express convenience store in Skull Valley. The Skull Valley wind rose is based on meteorological data from December 19, 1996, through December 29, 1998.The percentage of the time the wind is from each direction is plotted as a series of bar segments extending from the center of the diagram toward the direction from which the winds come. Wind-speed classes are represented by width and shading of the bar segments; the length of any segment indicates the percentage of all measurements for which the wind is from the indicated direction and also in the indicated wind- speed class. Units of wind speed are given in meters per second (m/s) and miles per hour (mph).

period, and a fastest mile of 90 mph implies that an average wind speed of 90 mph was measured over a 40-sec period.

Fastest mile is a traditional measure of sustained wind speed for use in calculating wind loads for design of buildings and other structures; statistical estimates of the highest values expected during periods of 50 and 100 years at Salt Lake City are given by Mehta et al. (1991) as 70 and 75 mph. Those values are consistent with the highest value of 71 mph at SLCIA, over a 56-year period, given in the Safety Analysis Report (SAR) for the proposed facility (PFS/SAR 2001).

Another measure of extreme wind speed is the peak gust (the highest “instantaneous” wind speed), which will be greater than the fastest mile over the same time period. Statistical estimates of the peak gusts expected during periods of 50 and 100 years are reported in the SAR (PFS/SAR 2001) as 88 mph and 94 mph, respectively.

A tornado probability is typically given in terms of the likelihood of a particular location being within a path of tornado damage in any given year, and is expressed either in terms of the expected number of tornadoes per year or its reciprocal, the expected number of years between tornadoes at that particular location. The calculated probabilities are far beyond recorded experience, and, therefore, not always intuitively reasonable. A probability of 1.37 tornadoes per million years (or about 1 tornado per 730,000 years) at the site of the proposed PFSF was obtained by PFS (PFS/ER 2001), based on a typical tornado damage path area of 0.09 km^2 (0.035 $miles^2$). The probability of a tornado creating such a damage path somewhere within an area 10,000 times that large is simply the probability given above multiplied by 10,000, or 0.0137 tornadoes per year. This corresponds to 1 tornado per 73 years within an area of 900 km^2 (350 $miles^2$), which may be thought of as 16 km (10 miles) wide and 56 km (35 miles) long, about the same dimensions as the floor of Skull Valley. To extend this calculation to much larger areas would be meaningless because of the differences in tornado probabilities that are likely to occur in different parts of larger areas (e.g., in the mountains to the east or west).

It was noted by PFS (see PFS/SAR 2001) that Ramsdell and Andrews (1986) give a higher tornado probability, 3.06 in a million, for any particular location in the State of Utah as a whole. Available data would seem to justify estimates of tornado probability ranging from about 1.37 in a million to about 3 in a million, or from about 1 tornado in 33 years to 1 in 73 years occurring somewhere within the 350 square miles area considered above.

A tornado struck downtown Salt Lake City on August 11, 1999; this was the first tornado to strike inside the city limits since 1968. It was also more intense than most tornadoes in Utah; damage-based wind speed estimates were between 100 and 150 mph, leading to a classification of level 2 (i.e., F2) on the Fujita intensity scale. Imprecise measurements of tornado winds, made with Doppler radar, have indicated speeds as high as 318 mph, in an F5 tornado near Oklahoma City on May 3, 1999 (Monastersky 1999; NOAA 1999). However, tornadoes of intensity of F3 or greater, associated with wind speeds greater than about 150 mph (Grazulis et al. 1993), are so infrequent in the Great Basin that calculations of their probabilities are of questionable value. Although the expected damage area of an F3, F4, or F5 tornado is much larger than the more typical value of 0.09 km^2 (0.035 $miles^2$) used above, the probability of occurrence of such a tornado anywhere in Skull Valley is extremely small.

3.3.2 Air Quality

Air quality is evaluated by comparing measured air pollutant concentrations with National Ambient Air Quality Standards (NAAQS), which have been established by the EPA to protect human health and welfare with an adequate margin of safety (40 CFR Part 50). These national standards apply to six

> **AIR QUALITY DESIGNATIONS**
>
> **Attainment Area**—Any area that meets the national primary or secondary ambient air quality standard for the pollutant.
>
> **Nonattainment Area**—Any area that does not meet (or that contributes to ambient air quality in a nearby area that does not meet) the national primary or secondary ambient air quality standard for the pollutant.

common air pollutants, namely: sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), carbon monoxide (CO), lead (Pb), and two sizes of particulate matter: 10 µm or less in diameter, designated PM-10, and 2.5 µm or less in diameter, designated PM-2.5. These are called *criteria pollutants* because the criteria for regulating them must be published (CAA, Section 108). Primary NAAQS define levels of air quality which the EPA deems necessary, with an adequate margin of safety, to protect human health; secondary NAAQS are similarly designated to protect human welfare by safeguarding environmental resources (such as soils, water, plants, and animals) and manufactured materials. Primary and secondary standards are currently the same for all pollutants and averaging periods except for 3-hour SO_2 averages, which have only a secondary standard.

NAAQS are expressed as concentrations of pollutants in the ambient air—that is, the outdoor air to which the general public has access [40 CFR 50.1(e)]. Concentrations of criteria pollutants at locations corresponding to the general guidelines in 40 CFR Part 58, Appendix D, are monitored by EPA to compare air quality with NAAQS. State and local monitoring stations are sometimes available to provide supplementary data. Monitored values of criteria pollutants can be accessed from EPA's Aerometric Information Retrieval System (AIRS) data base, accessible from the EPA home page [(http://www.epa.gov/air/data/monitors.html); accessed February 16, 2000].

Tooele County is in attainment of all NAAQS except for an SO_2 nonattainment classification applicable only to those parts of the county above 5,600 ft in elevation. However, the only SO_2 monitoring in Tooele County was discontinued in October 1997 as a result of the low concentrations that were measured (Utah Department of Environmental Quality 1998). Air quality data for 1995 to 1999 from the monitoring stations nearest to Skull Valley are presented, along with their corresponding standards, in Table 3.3.

The SO_2 standards for periods of 24 hours or less apply to the second highest value in a calendar year at any particular location; therefore, the highest value for each year at each monitor was excluded from the data, and the highest of the remaining values (the highest second-highest value) for 1995–1999 is compared with the standards in Table 3.3. All SO_2 concentrations were less than 15 percent of applicable standards.

Like the SO_2 standards for short-term averages, CO standards apply to the highest second-highest concentrations for each year; these concentrations are presented in Table 3.3. Most monitoring for

Table 3.3. Summary of air quality for the Skull Valley area for 1995–1999

Pollutant	Averaging period	Nearest monitoring location	Year of maximum	National Ambient Air Quality Standard[a]	Concentration[a]	Concentration as a percent of standard
Sulfur dioxide (SO_2)	3-hour[b]	Magna[c]	1995	0.50 ppm	0.040 ppm	8
	24-hour[b]		1995	0.14 ppm	0.015 ppm	11
	Annual[d]		1995	0.03 ppm	0.002 ppm	7
Carbon monoxide (CO)	1-hour[b]	Salt Lake City	1996	35.0 ppm	12.0 ppm	34
	8-hour[b]		1996	9.0 ppm	6.9 ppm	77
Nitrogen dioxide (NO_2)	Annual[d]	Bountiful	1997	0.053 ppm	0.021 ppm	40
Ozone (O_3)	1-hour[e]	Lakepoint	1996	0.124 ppm[e]	0.123 ppm[f]	99
Lead (Pb)	Calendar	Magna	1997	1.5 µg/m³	0.1 µg/m³	7
Particulate matter ≤10 µm in diameter (PM-10)	24-hour[g]	Magna[c]	1998[g]	150 µg/m³	87 µg/m³	58
	Annual[g]		1997[g]	50 µg/m³	22 µg/m³	44
Particulate matter ≤2.5 µm in diameter (PM-2.5)[g]	24-hour	g		65	g	g
	Annual	g		15	g	g

[a]Standards and monitored concentrations are expressed as parts per million (ppm) by volume for gases, and as micrograms per cubic meter (µg/m³) for lead and particulate matter (40 CFR Part 50).

[b]The highest value for each year has been excluded and the highest of the remaining concentrations is shown for comparison with the standard, as per 40 CFR Part 50.

[c]Grantsville was the nearest monitoring station until 1997; Magna is now the nearest station. Concentrations at Grantsville were generally lower than those at Magna.

[d]The maximum annual (or, for lead, quarterly) concentration during 1995–1999.

[e]The hourly ozone standard applies to the fourth highest value in any three successive years. An 8-hour standard for ozone was promulgated by EPA in 1997 (FR 62 38856); however, legal challenges to that standard resulted in a decision by the U.S. Supreme Court on February 27, 2001 which directed EPA to develop a reasonable approach to implementing the standard [Whitman v. American Trucking Assn., Inc., 531 US 457 (2001)]. Further developments in this area are only speculative at this time.

[f]The value given is the 4th highest during 1996–1998; during that period, the standard has exceeded the maximum allowable three times and the highest measured hourly concentration was 0.145 ppm at the Lakepoint monitor. The next nearest ozone monitor is in Herriman, where the 4th highest value in any successive three years was 0.111 ppm, and the highest value was 0.115 ppm. On July 18, 1997, EPA promulgated an 8-hour ozone standard. However, the U.S. Supreme court directed EPA to develop a different standard. See Whitman v. American Trucking Assn. Inc., 531 US 457 (2001).

[g]The 24-hour standard is not to be exceeded more than three times in three years, and the annual average refers to the average of three successive annual values (40 CFR Part 50, Appendix K). Years listed as providing the maximum values refer to the ending year of the corresponding 3-year period. On July 18, 1997, EPA promulgated new standards for particulate matter less than 2.5 µm in diameter (PM-2.5) (62 Fed. Reg. 38652). These standards have now survived court challenges, and will become effective when sufficient monitoring data are in place. It is expected that these standards will become effective during construction or operation of the proposed facility.

Source: http://www.epa.gov/air/data/monitors.html; accessed February 16, 2000.

CO is in large cities where traffic congestion leads to long idling times of large numbers of commuter vehicles during rush hour; CO is not generally a pollutant of concern outside of large cities. In Salt Lake City, 8-hour average CO concentrations were as high as 77 percent of the standard during 1996.

Only an annual standard exists for NO_2; annual average NO_2 concentrations at the nearest monitoring station over the past 5 years have always been less than 50 percent of the standard. The 1-hour ozone standard requires that no more than three days in any 3-year period have one or more hourly concentrations in excess of 0.12 ppm by volume (40 CFR Part 50) [when rounded to two decimal places in accordance with EPA guidance (see EPA 1979)]. Although concentrations higher than 0.12 ppm occasionally occurred, ozone concentrations never exceeded the standard more than three times in any 3-year period at the nearest monitoring location, in Lakepoint. At the next-nearest monitor, in Herriman, no ozone concentration over the 1-hour ozone standard was recorded from 1995 to 1999.

An 8-hour standard for ozone was promulgated by EPA in 1997 (62 FR 38856); however, legal challenges to that standard resulted in a decision by the U.S. Supreme Court on February 27, 2001 which directed EPA to develop a reasonable approach to implementing the standard [Whitman v. American Trucking Associations, Inc., 531 US 457 (2001)]. Further developments in this area are only speculative at this time. However, the Supreme Court did not question the level of the standard, which is 84 parts of ozone per billion parts of ambient air on a volumetric basis, applicable to the 3-year average of each year's 4^{th} highest daily maximum 8-hour average. The 8-hour averages presented by the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO) (STAPPA/ALAPCO, 2001) indicate that the new standard is exceeded (by less than 5%) at all 4 monitoring stations in Salt Lake County that have data for 1998, 1999, and 2000.

Lead concentrations in the Salt Lake City area have been less than 10 percent of the standard over the past several years; atmospheric concentrations of lead have been declining in recent years, largely as a result of the reduced use of leaded gasoline.

Standards for particulate matter apply to statistical values derived from three years of data. Near Skull Valley, maximum PM-10 concentrations have recently been around 50 percent of their corresponding standards.

The NAAQS for PM-2.5 were promulgated in 1997. A multi-year data set sufficient for estimating background concentrations is not yet available, nor are generally accepted estimates of construction emissions for use in atmospheric dispersion modeling. It is expected, however, that, for practical purposes, the NAAQS for PM-2.5 will become effective during construction or operation of the proposed facility.

In addition to NAAQS, which represent an upper bound on allowable pollutant concentrations, there are national standards for the prevention of significant deterioration (PSD) of air quality (40 CFR 51.166). The PSD standards differ from the NAAQS in that the NAAQS specify maximum allowable *concentrations* of pollutants, while PSD requirements provide maximum allowable *increases in concentrations* of pollutants for areas already in compliance with the NAAQS (i.e., in attainment). PSD standards are therefore expressed as allowable *increments* in the atmospheric concentrations of specific pollutants. PSD increments are particularly relevant when a major proposed action (e.g., involving a new source or a major modification to an existing source) may degrade air quality without exceeding the NAAQS, as would be the case, for example, in an area where the ambient air is very clean. Allowable PSD increments currently exist for three pollutants (NO_2, SO_2, and PM-10). One set of allowable increments exists for Class II areas, which cover most of the United States, and a much more stringent set of allowable increments exists for Class I areas, which are specifically designated areas where the degradation of ambient air quality is to be severely restricted. Class I areas include many national parks and monuments, wilderness areas, and other areas as specified in 40 CFR 51.166(e). The nearest Class I PSD area is the Capitol Reef National Park, about 240 km (150 miles) south-southeast of the site of the proposed PFSF.

There are no Federal requirements for applying standards for the prevention of significant deterioration (PSD) of air quality to temporary, construction-related, activities such as those associated with the proposed PFSF, and discussed in Section 2.1, or to stationary sources, such as the facility itself, which would not emit significant amounts of pollutants as defined in 40 CFR 51.166.

3.4 Ecological Resources

This section describes the ecological resources of Skull Valley in the vicinity of the proposed and alternative sites for the proposed PFSF, the related transportation corridors, and the ITF near Timpie. The emphasis of this description is on selected plant and animal species, biodiversity, and ecosystems of special concern to the FWS, BLM, and the Utah Division of Wildlife Resources (UDWR) that may be individually or cumulatively affected by the proposed action or alternatives. The concern for potential effects on these resources stems primarily from their importance as threatened, endangered, or special concern species; game species; indicator species; or ecosystems in danger of being eliminated or becoming less diverse.

3.4.1 Terrestrial Resources

3.4.1.1 Vegetation

Skull Valley is located in the saltbush-greasewood (*Atriplex-Sarcobatus*) section of the Intermountain Sagebrush Province (Bailey 1980; Küchler 1964). This ecosystem consists of open stands of low and dwarf shrubs, dominated by species such as shadscale (*Atriplex confertifolia*) and greasewood (*Sarcobatus vermiculatus*). The mountains on the east and west sides of the valley are classified as juniper-pinyon pine woodland (Küchler 1964) consisting of open groves of low evergreen trees with varying admixtures of shrubs and herbaceous plants. Common trees and shrubs in the valley include big sagebrush (*Artemisia tridentata*), saltbush species (*Atriplex* spp.), shadscale, rabbitbrush species (*Chrysothamnus* spp.), and greasewood, among others (Ehleringer undated). The most abundant grass is an exotic annual weed, cheatgrass (*Bromus tectorum*).

Biological soil crusts (also known as cryptogamic or cryptobiotic soil crusts) commonly occupy the nutrient-poor zones between vegetation clumps in such arid ecosystems (Belnap et al. undated). These crusts are a complex mosaic of living organisms, including algae, cyanobacteria (also known as blue-green algae), bacteria, lichens, mosses, liverworts, and fungi (BLM undated). Biological soil crusts photosynthesize, provide habitat for fauna, stabilize soil, increase soil fertility by fixing nitrogen, help the soil retain moisture, enhance seedling establishment, help keep out unwanted plants (for example, exotic weeds), and absorb energy from the sun (Belnap 1994, Belnap et al. undated, BLM undated). Small amounts of these soil crusts are located in the proposed project area as described in the Tooele County Soil Survey and corresponding range site descriptions.

Due to numerous, large fires (primarily caused by lightning) and the aggressive nature of overgrazing, cheatgrass has invaded and replaced the natural vegetation in much of Skull Valley (BLM 1998c).

Within the Intermountain Region, extensive wildfires frequently occur on disturbed range and wildlands occupied by annual weeds (Monsen 1995). Wildfires now occur in Skull Valley with a frequency of at least once every three years. Fire can damage vegetation, but it can also stimulate growth and succession (Wright and Bailey 1982). In areas of desert shrub and saltbush vegetation, repetitive fires destroy the native species (BLM 1998c). Since desert shrub and saltbush cannot compete with annual grasses, they do not naturally reestablish; instead, almost pure stands of annual grass become established. Once annual grasses invade, an area becomes increasingly susceptible to subsequent fires. However, if fires do not occur every 3 to 5 years, the salt desert shrub would naturally become reestablished.

The Salt Lake District of BLM has adopted a fire management plan for all the resource management areas in the district, including the Pony Express area that covers Skull Valley (BLM 1998c). Most of Skull Valley falls into the fuel type categorized by BLM as annual grass with desert shrub in which wildland fire is not desired. In Skull Valley BLM's goal is to reduce fire size by using fuel or vegetation management procedures (e.g., prescribed fire, mechanical manipulation, seeding to less flammable and more desirable species, fuelbreak establishment). Prescribed fires and mechanical or chemical treatments would generally be limited to black stripping (i.e., creating a fuelbreak by removing all vegetation), as either a hazardous fuel reduction method or as site preparation for green stripping projects (i.e., creating a fuelbreak by planting naturally fire-resistant vegetation). The goal of the 1998 Fire Management Plan is to contain 90 percent of fires of all intensity levels at 121 ha (300 acres) or less and to contain fires in areas that consist primarily of native desert shrub species and perennial grasses at 40 ha (100 acres) or less. According to BLM, these objectives may be difficult to achieve under ideal conditions and will require aggressive suppression efforts to achieve.

The proposed and alternative PFSF sites are nearly flat and are dominated by widely-spaced desert shrub species, perennial grasses, and annuals. Figure 3.6 shows the vegetative micro-communities that were identified on the proposed and alternative sites (Stone and Webster 1996). As shown in Figure 3.6, the proposed site (Site A) is about 70 percent grass and 30 percent bare ground. It is mainly vegetated by grasses, with the northeast corner being a community of primarily low shrubs. The alternative site (Site B) has a greater diversity of micro-communities, with shrubs and grasses being the dominant vegetation types. Vegetation observed on the preferred site and along the proposed access road to it includes cheatgrass, sagebrush, shadscale, saltbush, tumbleweed (*Amaranthus albus*), various species of cacti, greasewood, and freckled milkvetch (*Astragalus lentigenosus*). With the exception of the Skull Valley Band village, no trees are located within 8 km (5 miles) of the proposed PFSF site (PFS/ER 2001).

The vegetation at the proposed Skunk Ridge railhead and along the proposed Skunk Ridge rail corridor on the west side of Skull Valley is generally very similar to that found at the proposed and alternative PFSF sites and along Skull Valley Road and includes areas dominated by cheatgrass (PFS/RAI1 1999). The habitat on the west side of Skull Valley is in general, somewhat more open than that on the east side.

The area of the ITF near Timpie is highly disturbed, with no unique ecological communities (PFS/ER 2001). It is dominated by greasewood with native salt desert shrubs and native grasses being sparse to virtually absent (PFS/ER 2001).

Plant species that are considered threatened, endangered, and species of special concern are discussed in Section 3.4.3.1.

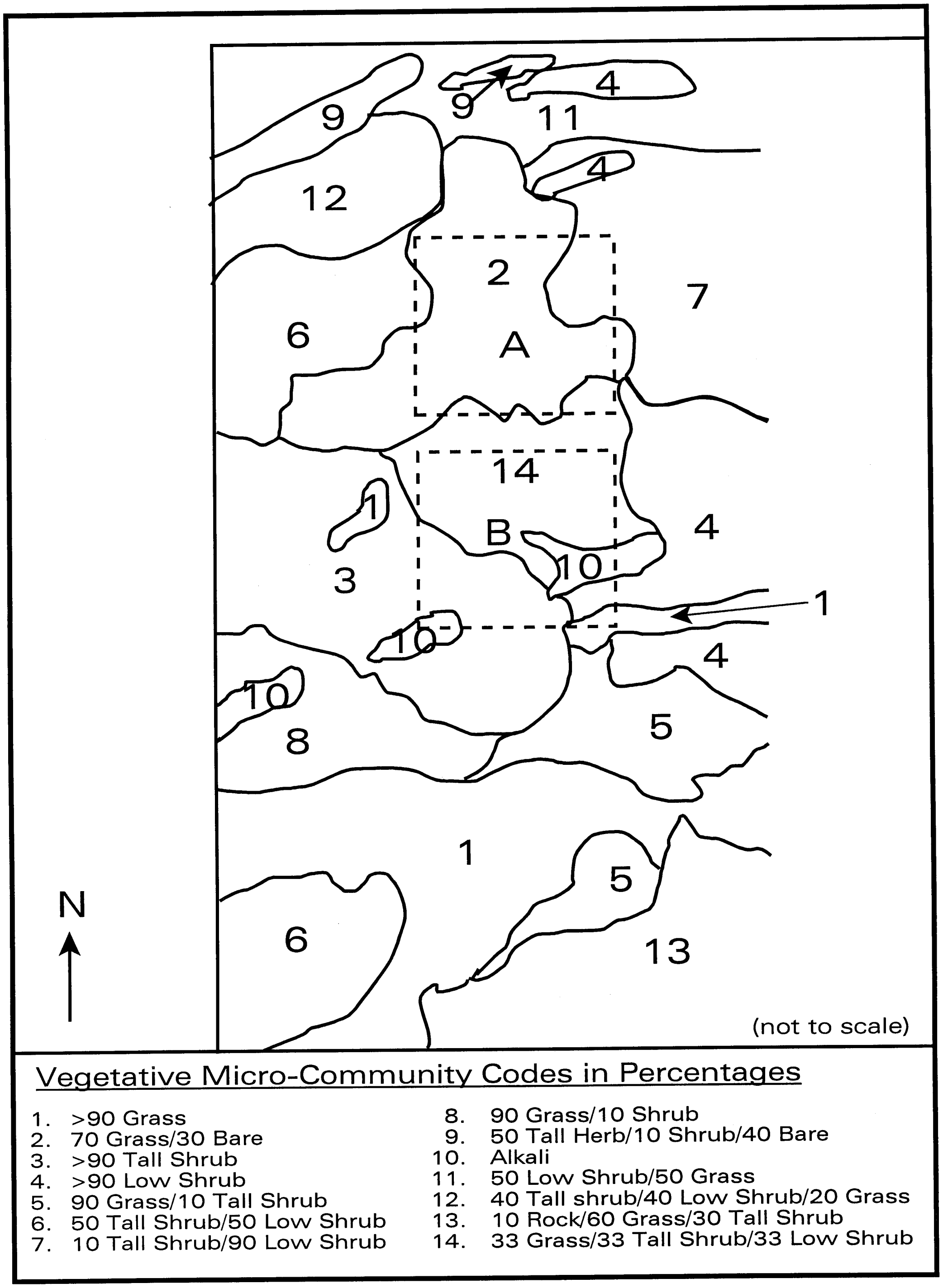


Figure 3.6. Vegetative micro-communities on the proposed PFSF site (Site A) and the alternative site (Site B) on the Reservation.

3.4.1.2 Wildlife

The open habitats of Skull Valley support a number of wide ranging wildlife species including, among others, pronghorn antelope (*Antilocapra americana*), mule deer (*Odocoileus hemionus)*, eagles, owls, and a variety of hawks including ferruginous (*Buteo regalis*), rough-legged (*Buteo lagopus*) (winter) and Swainson’s hawks (*Buteo swainsoni*), and northern harriers (*Circus cyaneus*). The valley [108,400 hectares (271,000 acres)] offers open areas in which these animals may feed, hunt, and winter (BLM 1998; UDWR 1999).

Typical mammal species found in the vicinity of the proposed project site include ground squirrels (*Citellus sp.*), jack rabbits (*Lepus sp.),* kangaroo rats (*Dipodomys sp.*), mice (*Peromyscus sp.*), coyote (*Canis latrans*), fox (*Vulpes sp.*), badger (*Taxidea taxus*), and skunk (*Mephitis mephitis*) (PFS 1998). Pronghorn antelope, mule deer(both big game species), and wild non-native (i.e., feral) horses were observed during various surveys in 1998. Skull Valley is an important winter area for these three animal species (UDWR 1999).

There are approximately 850 mule deer in the West Desert Herd and 13,400 in the Stansbury Herd. Mule deer use both the Cedar and Stansbury mountains and move down in the valley during the winter. Wintering areas identified by UDWR are to the north of the Reservation, to the east of Skull Valley Road, and in the foothills of the Cedar Mountains (see Figure 3.7). It is likely that mule deer would occur in the vicinity of the PFS site, along Skull Valley Road, and along the Skunk Ridge rail line corridor (UDWR 1997a and 1999).

Pronghorn antelope in Skull Valley are part of the West Desert Herd Unit 2, consisting of approximately 130 animals. This herd, for the most part, uses areas to the west, north, and south of Skull Valley (PFS/ER 2001; UDWR 1999).

A herd of approximately 350 feral horses occupies the Cedar Mountains Wild Horse Herd Management Area. This area encompasses the Cedar Mountains from Hastings Pass near I-80 on the north to the Dugway Proving Ground on the south. The southern portion of the Cedar Mountains is a wild horse herd management area. BLM’s management goals are to keep the horses within the herd area and maintain an appropriate level of horses based on the amount of vegetation. The Skunk Ridge rail line corridor may be used as feeding areas by these animals, especially during the winter (UDWR 1999; BLM 1988a and 1998).

Birds common to the proposed PFSF site and proposed Skunk Ridge rail line corridor include common raven (*Corvus corax*), black-billed magpie (*Pica pica*), western meadowlark (*Sturnella neglecta*), lark sparrow (*Chondestes grammacus*), horned lark (*Eremophila alpestris*), ferruginous hawk, and kestrel (*Falco sparverius*). Hawk nesting habitat is present along Skull Valley Road, at Hickman Knolls to the south of the proposed PFSF site, in the foothills of both the Cedar and Stansbury Mountains, and in areas where trees occur in Skull Valley. Numerous hawk nesting sites have been identified throughout the valley, including along Skull Valley Road and the proposed Skunk Ridge rail line corridor (PFS/ER 2001; Stone & Webster 1998; UDWR 1997a). Various hawk species currently use the proposed PFSF site as well as the Skunk Ridge rail line corridor as part of their feeding territories.

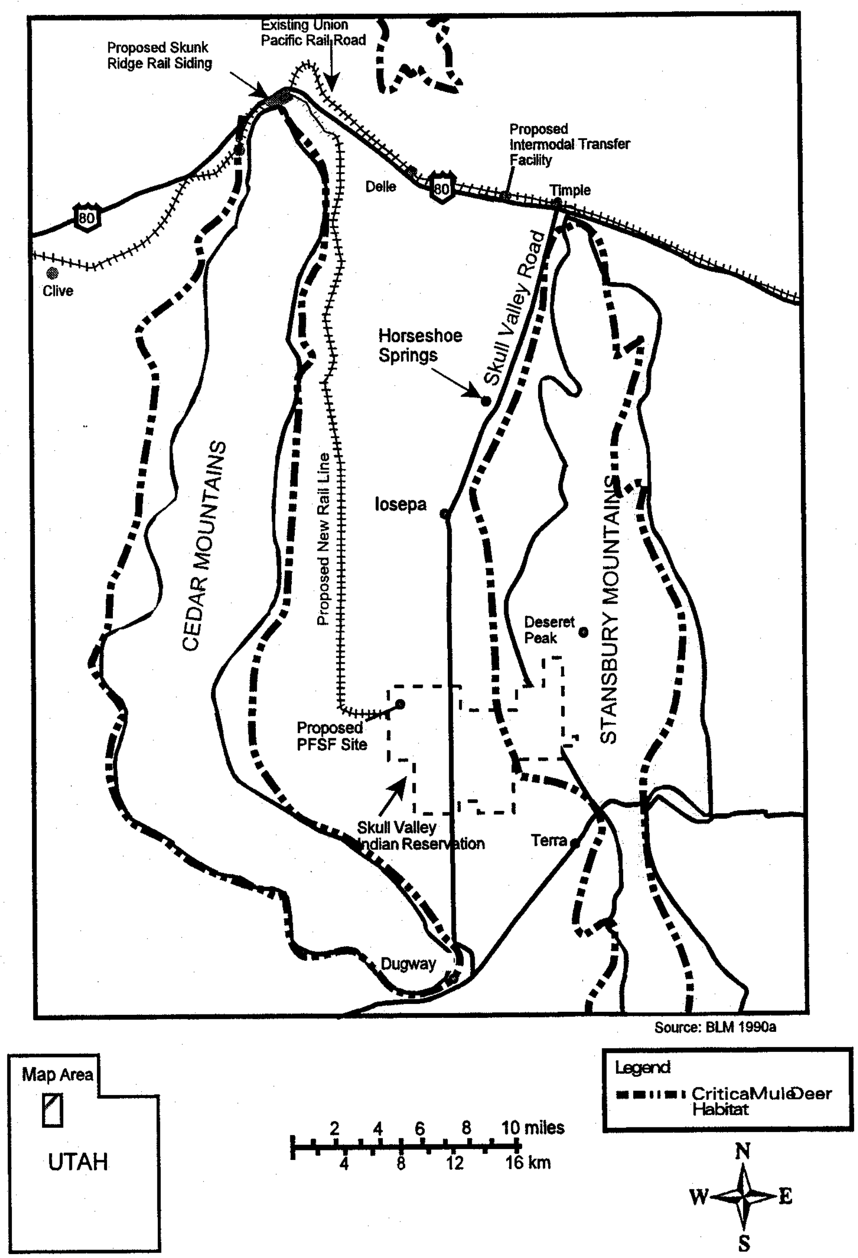


Figure 3.7. Critical mule deer habitat within Skull Valley.

A number of upland game species are found in Skull Valley. These species include Hungarian partridge (*Perdix perdix*), ring-necked pheasant (*Phasianus colchicus*), chukar (*Alectoris chukar*), and mourning dove (*Zenaida macroura*). Hungarian partridge, ring-necked pheasant, and chukar are exotic game species (National Geographic Society 1983). Partridge and pheasant prefer areas of small grain crops. Areas just north of the Reservation are used to grow alfalfa. UDWR indicate that use areas for both the partridge and pheasant are present within one half mile of Skull Valley Road, north of the project site (UDWR 1999). Chukars are common within habitats of the foothills and slopes of the Stansbury and Cedar Mountains (PFS/ER 2001; UDWR 1997a; UDWR 1999). Chukars may use areas within the proposed Skunk Ridge railroad corridor and just east of Skull Valley Road north of the proposed PFSF site (UDWR 1999). The mourning dove, a native game species, is common throughout Skull Valley, including the Reservation, the Skunk Ridge corridor, and along Skull Valley Road.

Waterfowl, shorebirds, and wading birds use mudflats and wetlands (e.g., Horseshoe Springs) in the northern portions of the valley (see Section 3.4.2.2 for more information on wetlands wildlife). In addition, the Great Salt Lake, approximately 45 km (30 miles) north of the proposed site and 5 km (3 miles) northeast of the proposed Timpie ITF area, is important for migratory birds. The lake supports between 2 and 5 million shorebirds and hundreds of thousands of waterfowl during spring and fall migration (USGS 2000). Because of its importance to migratory birds, the lake was designated a part of the Western Hemisphere Shorebird Reserve Network in 1992. The lake and its marshes provide a resting and staging area for the birds, as well as an abundance of brine shrimp and brine flies that serve as food. The Migratory Bird Treaty Act of 1918, as amended, 16 USC 703, *et seq.*, protects migratory birds included in the terms of the conventions identified in 16 USC 703

The habitats of the proposed new rail line which is to run south from Skunk Ridge, to the west and north of the proposed PFSF site, are very similar to most of Skull Valley, although, as mentioned in Section 3.4.1.1, the vegetation is somewhat more widely spaced.

The proposed ITF near Timpie is near both Interstate-80 and the Union Pacific railroad. It is a previously disturbed site with little current value to wildlife.

Threatened, endangered and other species of special concern are discussed in Section 3.4.3.

3.4.2 Aquatic Resources

3.4.2.1 Perennial and Ephemeral Streams

As discussed in Section 3.2.1.1, Indian Hickman Creek is the stream nearest to the proposed PFSF site. The creek is fed from springs in the Stansbury Mountains and has moderate flow in the wet season. Trout are known to inhabit the creek.

There are no perennial streams found within the area of the proposed or alternative PFSF sites, along the Skunk Ridge transportation corridor, or at the ITF near Timpie. A number of ephemeral stream channels, essentially dry washes, are identified on USGS quadrangles within an 8-km (5-mile) radius of the proposed PFSF site and within 0.8 km (0.5 mile) of the Skunk Ridge transportation corridor. Some of these ephemeral streams may be identified as “waters of the United States” by the Corps of Engineers. However, because of their ephemeral nature, none of them would be expected to support any aquatic biota.

3.4.2.2 Wetlands

Wetlands are important to a wide variety of wildlife, livestock, watershed, and recreation values (BLM 1992a) and are used by wildlife disproportionately more than any other type of habitat (Bridges et al. 1998). Although such areas comprise less than 9 percent of all land in the United States administered by BLM, they are the most productive and highly prized resources found on BLM lands (Bridges et al. 1998). In regions such as Utah where water is scarce, roughly 90 percent of the birds and most of the mammals use wetland and riparian habitats during some part of their life cycle (Stewart 1998).

Wetlands are uncommon in Skull Valley. There are none on the proposed or alternative PFSF site (PFS/ER 2001) or along the Skunk Ridge transportation corridor. Some wetlands are found near Skull Valley Road in the northern part of Skull Valley. These wetland areas support plants such as three-square bulrush (*Scirpus pungens*), spikerush (*Eleocharis palustris*), and saltgrass (*Distichlis spicata*) (BLM 1992a). The wetland area in northern Skull Valley, identified by BLM as the Horseshoe Springs Wildlife Habitat Area (WHA), consists of 25,611 ha (63,286 acres), of which BLM manages almost 85 percent (BLM 1992a) (see Figure 3.8). This area provides crucial habitat for many species of wildlife, as it supplies the only major public water source in Skull Valley for miles around and, thus, it attracts a large variety of wild animals.

Of the wetlands in the WHA, the most obvious and largest one is the 308-ha (760-acre) area surrounding Horseshoe Springs, which has been designated an Area of Critical Environmental Concern (ACEC) by BLM (BLM 1990). An ACEC designation protects and recognizes the unique, environmentally sensitive, wetlands and springs within that region. Horseshoe Springs is located approximately 24 km (15 miles) north of the proposed facility site, 335 m (1,100 ft) west of Skull Valley Road, 11 km (7 miles) from the rail corridor, and nearly 16 km (10 miles) from the proposed ITF near Timpie. Other, smaller springs also occur to the north and south of Horseshoe Springs (see Figure 3.8), but only Horseshoe Springs supports fish and snails (BLM 1992a).

These wetlands are used by many wildlife species such as falcons, hawks, owls, gulls, shorebirds [e.g., willets (*Catoptrophorus semipalmatus*), American avocets (*Recurvirostra americana*), and black-necked stilts (*Himantopus mexicanus*)], wading birds (e.g., herons, ibises), ducks, swallows, muskrats (*Ondatra zibethicus*), and various amphibians and fish species. Mink also use northern portions of Skull Valley along Skull Valley Road (UDWR 1997a).

3.4.3 Threatened, Endangered, and Other Species of Special Concern

Table 3.4 lists all species of special concern known to be on or in the vicinity of the proposed PFSF site or along the transportation corridors in Skull Valley. This list is also applicable to Site B in Skull Valley. Consultation with the FWS has been conducted to comply with Section 7 of the Endangered Species Act (see Appendix B).

3.4.3.1 Plants

No Federal listed threatened, endangered, proposed, or candidate plant species are known to or likely to occur in Skull Valley. The FWS identified Ute ladies'-tresses (*Spiranthes diluvialis*), a Federally listed threatened species, as a species that may occur in the area of the proposed action. (See Appendix B, letter dated June 22, 1999, from Reed E. Harris, FWS, to Mark Delligatti, NRC). One

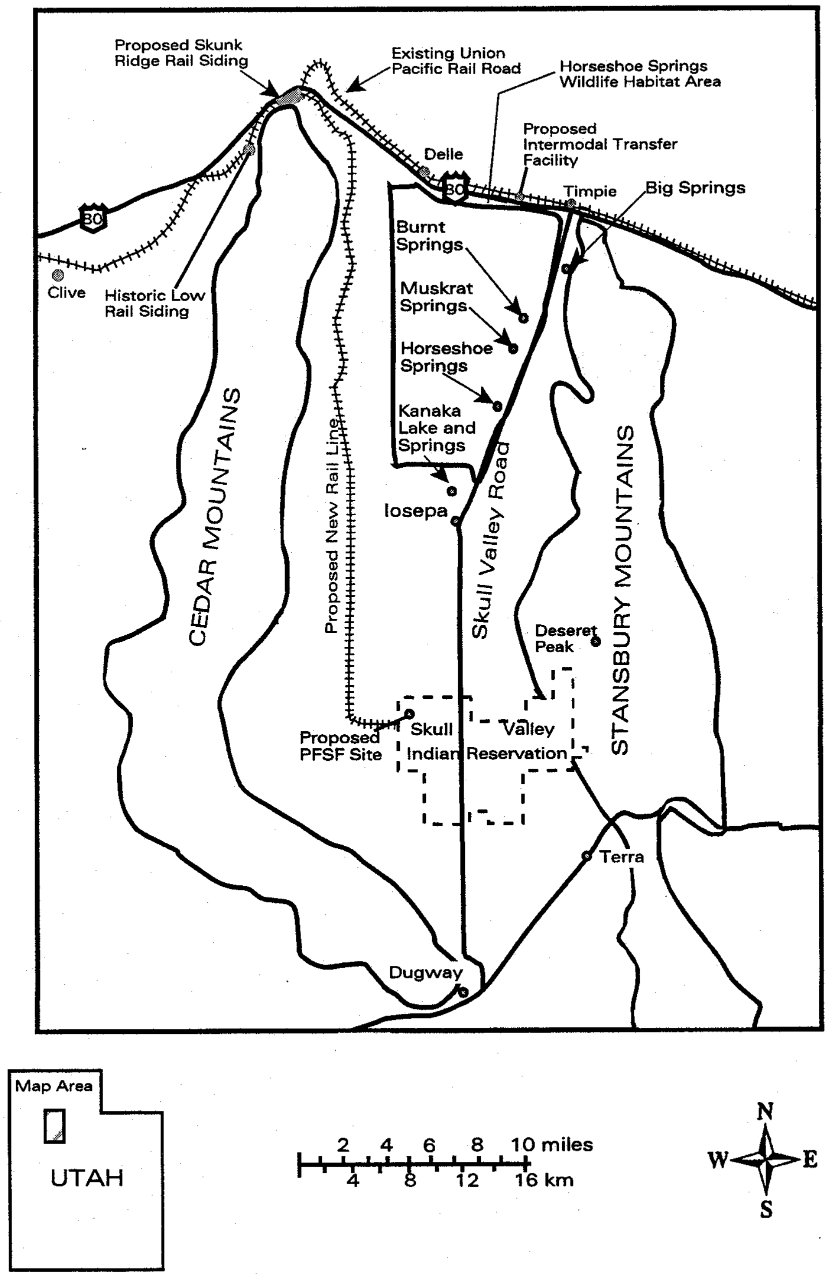


Figure 3.8. Location of major springs in Skull Valley.

Table 3.4. Skull Valley Federal and State species of special concern expected to use or be present at or near the proposed PFSF site or alternate Site B or along the Skunk Ridge rail corridor

Common name	Scientific name	State status[a]	Federal status[a]
Plants			
Pohl's milkvetch	*Astragalus lentiginosus* var. *pohlii*	UDWRS1, CC	BLM2
Mammals			
Kit fox	*Vulpes macrotis*	—	BLM1
Skull Valley pocket gopher	*Thomomys bottae robustus*	CC	BLM1
Birds [present year-round, except as noted by (s) for summer or (w) for winter]			
Long billed curlew	*Numenius americanus*	SS	BLM1
Bald eagle (w)	*Haliaeetus leucocephalus*	SE	FT[b]
Golden eagle	*Aquila chrysaetos*	Int	BLM Int
Kestrel	*Falco sparverius*	Int	BLM Int
Peregrine falcon	*Falco peregrinus*	SE	NL
Prairie falcon	*Falco mexicanus*	Int	BLM Int
Northern harrier	*Circus cyaneus*	Int	BLM Int
Ferruginous hawk	*Buteo regalis*	ST	BLM1
Red-tailed hawk	*Buteo jamaicensus*	Int	BLM Int
Rough-legged hawk (w)	*Buteo lagopus*	Int	BLM Int
Swainson's hawk (s)	*Buteo swainsoni*	SS	BLM1
Burrowing owl (s)	*Athene Speotyto cunicularia*	SS	BLM1
Great-horned owl	*Bubo virginainus*	Int	BLM Int
Short-eared owl	*Asio flammeus*	SS	BLM1
Loggerhead shrike (s)	*Lanius ludovicianus*	—	BLM1
Turkey vulture (s)	*Cathartes aura*	Int	BLM Int
Amphibians			
Great Basin spadefoot toad[c]	*Spea intermontanus*	P	NL

[a]SE = State Endangered; ST = State Threatened; SS = State Sensitive; S1 = State Rank, typically 5 or fewer occurrences, rarity makes it vulnerable to extirpation; CC = Conservation Concern; BLM1 = Sensitive; BLM2 = potential; Int = State species of interest; BLM Int = BLM species of interest; P = State protected; NL = not Federally listed; FT = Federal threatened.

[b]On July 6, 1999, the FWS proposed to remove the bald eagle from the list of Endangered and Threatened species (see 64 Fed. Reg. 36454).

[c]Not expected to occur in the PFSF site but could potentially be present along the proposed Skunk Ridge rail corridor.

Sources: Utah Division of Wildlife Resources, Biological Assessment, 3/27/97; Utah State Sensitive Species List, 3/97; Letters from Reed Harris of Fish and Wildlife Service, 7/31/98 and 6/22/99; and Survey for the Site and Low Corridor, 7/30/98; Letter from John Kimball of Utah Division of Wildlife Resources, 1/6/99; PFS/ER 2001; Letter from Ron Bolander of BLM, 4/1/99; Letter from G. William Lamb, 6/30/98.

BLM special status plant that is rare in the state, Pohl's milkvetch (*Astragalus lentiginosus* var. *pohlii*), and one plant species that is of State conservation concern, small spring parsley (*Cymopterus acaulis* var. *parvus*), could occur there.

Special status plants are those plants found on public lands administered by BLM whose survival is of concern due to their limited distribution, low number of individuals or populations, or potential threats to habitat (BLM 1999b). BLM uses the term "special status plants" to include Federal endangered, threatened, proposed, and candidate species; State endangered, threatened, and rare species; and BLM sensitive plants. Sensitive plants are those species that do not occur on Federal or State lists, but are designated by the BLM State Director for special management consideration. BLM manages the conservation of special status plants and their associated habitats to ensure that actions it authorizes, funds, or carries out do not contribute to the need to list any species as threatened or endangered. The Utah State BLM Office maintains a list of all known and suspected special status plants on BLM lands.

Ute ladies'-tresses are found only in moist soils, in moist or wet meadows, and near springs, lakes, or perennial streams. A population of the species was last collected from Tooele County in 1956 at Willow Springs near the town of Callao (57 Fed. Reg. 2048, Jan. 17, 1992). Recent searches for the species in the Great Basin have failed to rediscover this historic population or any new populations. Since appropriate habitat for this species is not found in the area of the proposed action, it is unlikely to occur there.

A rare plant field survey was conducted in 1998 in Skull Valley in the area of the proposed PFSF and rail line (Kass 1998a, 1998b). Of the plant species that were suggested as potentially occurring within the proposed action area, only Pohl's milkvetch was found. Approximately six plants were discovered about 2.5 km (1.5 miles) southeast of the OCA for Site A on an abandoned road to Hickman Knolls, about 1 km (0.6 mile) southwest of Skull Valley Road. None were found on the proposed PFSF site or rail line. The six Pohl's milkvetch plants are located about 3.7 km (2.3 miles) from the center of the proposed storage pad area at Site A. Another Pohl's milkvetch plant was located in the same general area, but closer to Skull Valley Road.

Pohl's milkvetch, which occurs in greasewood communities at elevations of 1,330 to 1,650 m (4,364 to 5,414 ft) (Welsh et al. 1987), was formerly a Federal Category 2 candidate species (i.e., a species that was considered rare but for which the FWS did not have sufficient data available to support a proposed rule to list it as threatened or endangered). Although numerous varieties of this species are known to occur in Utah (Welsh et al. 1987), and this variety is endemic to Rush and Skull valleys, it is nonetheless considered rare in the State (i.e., it has a known or suspected rangewide viability concern) (UDWR 1998).

Small spring parsley, another species that was suggested as potentially occurring within the proposed action area, grows in desert shrub, sagebrush, and juniper communities at 1,400 to 1,585 m (4,593 to 5,200 ft) in Millard and Tooele counties (Welsh et al. 1987). Neither the plant itself nor suitable habitat for it was found in the area surveyed in Skull Valley (Kass 1998a, 1998b). Also, there are no records of it ever being located in the project area.

3.4.3.2 Wildlife

State and Federally listed wildlife species that are expected to use or be present at or near the proposed PFSF site or Site B or in habitats along the proposed Skunk Ridge rail corridor, are listed in Table 3.4. This table includes species that are listed by the FWS, the BLM, or the State of Utah. Other listed species discussed below have been mentioned by State or Federal agencies as potentially being in the area of the proposed site or in Skull Valley.

Federal threatened. Bald eagles (*Haliaeetus leucocephalus*) are Federally threatened and listed by Utah State as endangered. These birds are Federally protected under both the Endangered Species Act of 1973, as amended and the Bald and Golden Eagle Protection Act of 1940, as amended. The bald eagle has recently been proposed to be removed from the Federal endangered and threatened species list (64 Fed. Reg. 36454, July 6, 1999). Bald eagles winter in the Rush Valley near Rush Lake, over 32 km (20 miles) east of Skull Valley. During winter, bald eagles hunt in Skull Valley with roosting sites not far from the Reservation (see Figure 3.9). There are only four known bald eagle nest sites in Utah. The closest of these nest locations is on the Jordan River, over 113 km (70 miles) east of Skull Valley (UDWR 1997a).

State endangered. Peregrine falcons (*Falcon peregrinus*) have been removed from the Federal endangered species list (64 Fed. Reg. 46542, Aug. 25, 1999), but they are still Utah State-listed as endangered. The FWS removed the species from the Federal list after determining that it had recovered since the initial listing in 1970. Recovery was attributed primarily to restrictions on use of chlorinated pesticides (e.g., DDT, DDE) in the United States and Canada and to implementation of successful management activities, including captive breeding and releases of falcons within their historical range. These actions have resulted in a large increase in the numbers of birds in the United States. The number of peregrines nesting in Utah has increased greatly and continues to increase, and their distribution in the state has expanded (Messmer et al. 1998). When the species was removed from the Federal list in 1999, 164 pairs were known to occur in the state.

To aid in recovery of the species, a number of nesting towers—based on the historic distribution of peregrines in Utah—were placed around the shores of the Great Salt Lake, all of which have been used successfully for breeding. In addition, falcons are now also successfully breeding at locations around the Great Salt Lake other than the towers erected for that purpose. Timpie Springs was documented as an historic peregrine nesting site in a 1973 study (White 2001). It was, therefore, selected as a reintroduction site in the mid-1980s, and a nesting tower was placed in the Timpie Springs Waterfowl Management Area (WMA) in 1983. This tower was first occupied in 1988, and birds nesting there have successfully fledged young every year since then, except for a four-year period in the late 1990's. This nest is approximately 40 km (25 miles) north of the proposed PFSF site and about 5 km (three miles) east of the proposed ITF near Timpie. While the Skunk Ridge corridor and the proposed PFSF site do not include appropriate nesting habitat, peregrine falcons may use these areas for feeding (Stone & Webster 1998; PFS/ER 2000).

State threatened. The ferruginous hawk (*Buteo regalis*) is Utah State-listed as threatened. This hawk is a year-round resident of Skull Valley. It is known to nest in the foothills of the Cedar Mountains, west of the proposed PFSF site, and within the proposed Skunk Ridge rail line corridor. It nests on rock outcrops and cliffs and forages widely in valleys (UDWR 1997b). Ferruginous hawks have been sighted frequently near the proposed PFSF site and probably use the area for hunting.

State-listed species on tribal trust lands are not protected by state law; however, the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act do apply.

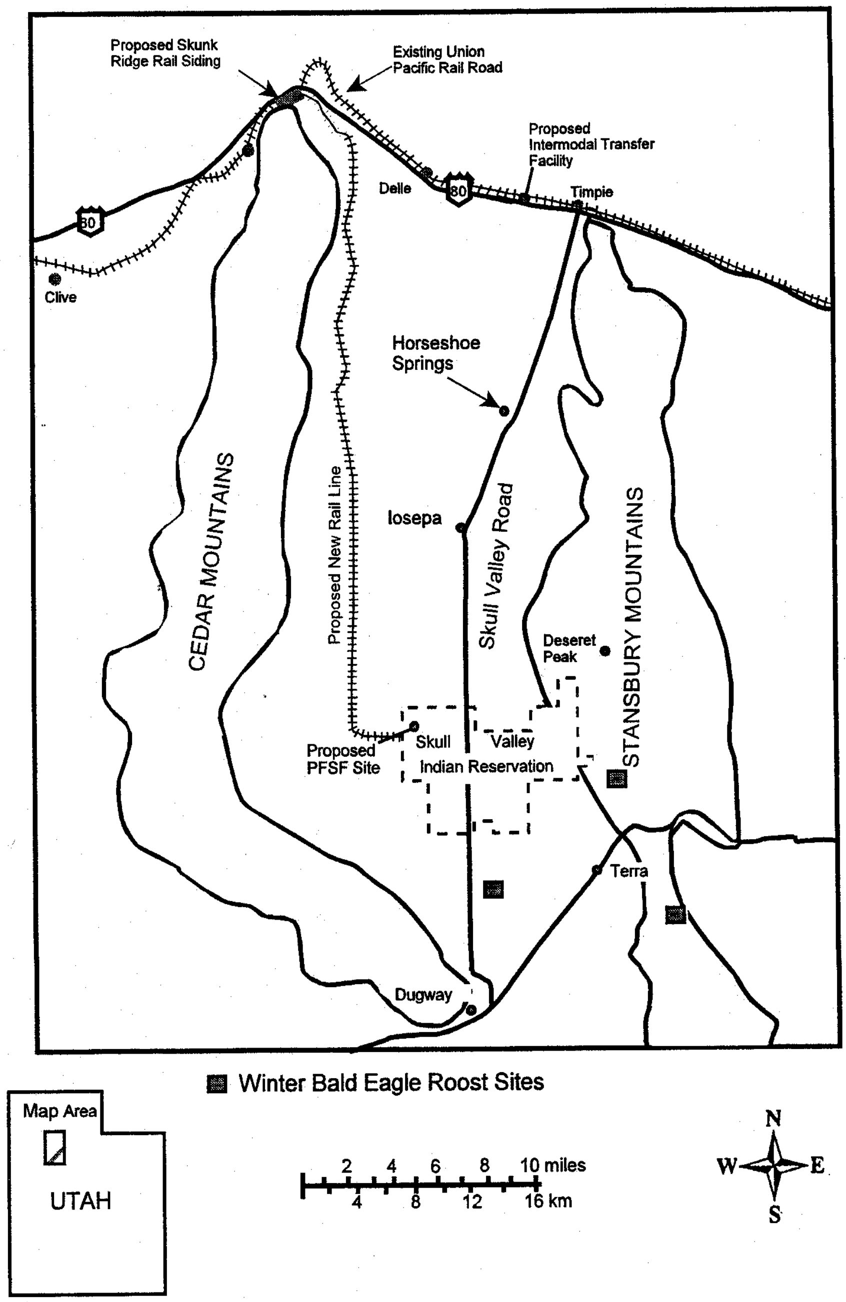


Figure 3.9. Winter roost sites for bald eagles in Skull Valley.

Federal candidate species. The mountain plover (*Charadrius montanus*) is a Federal candidate species. Candidate species are plants and animals native to the United States for which the FWS has sufficient information on biological vulnerability and threats to justify proposing to add them to the threatened and endangered species list, but cannot do so immediately because other species have higher priority for listing. The mountain plover, a neotropical migrant, is frequently associated with prairie dog colonies and nests in upland grass and shrub habitats, which do not occur on the proposed PFSF site. A small population of plovers is known to nest in the Uinta Basin, over 160 km (100 miles) east of Skull Valley (UDWR 1997b). There are no known populations of mountain plovers in Skull Valley and according to the UDWR, the mountain plover is not a concern because it is unlikely to occur in Skull Valley (PFS/ER 2001).

Conservation agreement species. A conservation agreement species is one which the State of Utah has identified as part of its goal to ensure the long-term conservation of the species within its historic range and assist in the development of statewide and rangewide conservation efforts (UDNR 1997; UDNR 1998). One such species is the least chub (*Iotichthys plegethontis*). This fish is in the minnow family (*Cyprinidae*) and occurs in springs, marshes, and stream habitats. Typically, it prefers the same habitats (i.e., shallow water wetlands of the west desert areas of Utah) as those inhabited by spotted frogs *(Rana luteiventris*) (UDNR 1997). This chub was previously proposed to be Federally listed as endangered but this proposal was withdrawn (64 Fed. Reg. 41062, July 29, 1999). Implementation of protective measures documented in the Conservation Agreement from 1997 has greatly reduced the possibility of the chub becoming endangered in the foreseeable future. The closest least chub populations to the project PFSF site are over 80 km (50 miles) to the southeast of the proposed action location (UDNR 1997).

The spotted frog is also a State conservation agreement species. This frog has been a Federal candidate species and recently, as a result of implementing protective measures documented in the Conservation Agreement of 1998 for the species, the threat of this species becoming endangered in the foreseeable future has been substantially reduced (63 Fed. Reg. 16218, April 2, 1998). The spotted frog occurs in the west desert areas of Utah in wetlands with small, clear, and cold-water habitats where shallow water is present with an abundance of herbaceous emergent vegetation (UDWR 1997b). Habitat for this species may be present in some of the wetlands along Skull Valley Road (e.g., Horseshoe Springs). However, the Conservation Agreement for the spotted frog does not list any populations in Skull Valley. Utah Lake (45 to 50 miles to the east) is the closest known site for the spotted frog (UDNR 1998).

Sensitive species. Two State sensitive bats have been mentioned by the State of Utah as potentially occurring in the area of the proposed project; the Townsend's big-eared bat [*Corynorhinus (Plecotus) townsendii*] and the Brazilian free-tailed bat (*Tadarida brasiliensis*) (UDWR 1999). Both of these species rely on caves or abandoned mines for their colonies or their communal roosts (UDWR 1997a, UDWR 1997b). These bats are not expected to use the site. However, the Townsend's big-eared bat has been identified in the Chokeberry Springs area of the Stansbury Mountains, approximately 16 km (10 miles) to the northeast of the proposed PFSF site. While not expected, it is possible that these bats could occasionally feed at the proposed PFSF site, but because there are no abandoned mines or caves in the area, that would be the extent of their activity (PFS/ER 2001).

The desert kangaroo rat (*Dipodomys desereti*) (a BLM sensitive species) and a close relative, the Merriams kangaroo rat (*Dipodomys merriami*), use desert shrub habitats similar to those present in Skull Valley. However, UDWR states that both species are restricted in Utah to only Washington County, in the extreme southwestern part of the State (UDWR 1997b).

The Skull Valley pocket gopher (*Thomomys bottae robustus*) and kit fox (*Vulpes macrotis*) are listed as sensitive by BLM (Table 3.4). The gopher prefers soft loamy soils to dig mounded burrows (Stone & Webster 1998). Habitat for this species is present at the proposed PFSF site, along Skull Valley Road, and along the Skunk Ridge railroad corridor. Skull Valley pocket gophers are very widespread throughout the valley (Pritchett 2001). Surveys in April and May 2001 of the potential project areas found 31 active burrow sites, including four within the construction zone for the PFSF access road and seven within the proposed rail access corridor (Pritchett 2001).

The kit fox is a BLM sensitive species and occurs in Skull Valley (BLM 1998; Burt and Grossenheider 1976). It prefers habitats that are open and contain sandy ground and low desert vegetation (Burt and Grossenheider 1976).The preferred prey species for kit fox are rabbits and desert rodents such as ground squirrels, rats, and mice (Whitaker 1980), which are common on the proposed PFSF site. Habitat is present for this fox along Skull Valley Road, the Skunk Ridge railroad corridor, and on the proposed PFSF site itself. A wildlife survey found no evidence of the kit fox along the Skunk Ridge rail line corridor or at the ITF, but fecal remains believed to be those of a kit fox were observed at Hickman Knolls (PFS/ER 2001).

A State sensitive mammal is the ringtail (*Bassariscus astutus*). The ringtail is not expected at the proposed PFSF site or along the Skunk Ridge Corridor, as it is dependent on having water nearby (UDWR 1997b). The ringtail could use the springs to the north of the project site, along Skull Valley Road.

The white-faced ibis (*Plegadis chihi*) and snowy plover (*Charadrius alexandrius*) are birds listed by BLM as sensitive species. BLM has indicated that these species should be expected to use the Horseshoe Springs wetland area (BLM 1997). Therefore, these birds are not expected to use the site or rail corridor. The State and BLM sensitive long-billed curlew (*Numenius americanus*) is thought to nest in the Horseshoe Springs area and along the proposed Skunk Ridge rail corridor (PFS/ER 2001). This shorebird nests in the upland meadows and rangelands of northern and central Utah valleys and forages in moist meadow wetlands and upland habitats (UDWR 1997a and 1997b).

The sage grouse (*Centrocerus urophasianus*) is a native game species. The sage grouse has declined approximately 50 percent since 1967, and because of this decline, it is listed as a sensitive species by the BLM and the State of Utah (UDWR 1999; UDWR 1997a and 1997b). Sage grouse breeding grounds, called leks, are usually associated with short cover in open areas. Wet meadows are vital for early brood rearing habitat. Use areas have been identified north and northeast of the proposed PFSF site along Skull Valley Road and in the foothills of the Stansbury Mountains. The closest use area to the Reservation appears to be approximately 16 km (10 miles) to the northeast (UDWR 1997a), therefore, the sage grouse is not expected to be present at the site or along the rail corridor.

The Utah milk snake (*Lampropeltris triangulum taylori*) was mentioned as possibly being in the area of the site by UDWR (UDWR 1999). However, it is not expected to use the project site or the Skunk Ridge rail corridor area, because it occurs in wooded mountain areas.

Other species of special concern. Raptors are a group of birds that the State of Utah and BLM consider to be species of interest. Hawks, falcons, owls, and eagles are protected under the Utah State Code. Disturbance that results in the abandonment of a raptor nest is an unlawful take and is in violation of Utah Code 23-13-2 (43). In addition to the species discussed previously (i.e., bald eagle, peregrine falcon, and ferruginous hawk), turkey vulture; golden eagle; swainson's, rough-legged, and red-tailed hawks; prairie falcon; kestrel; northern harrier; and burrowing, short-eared, and great-horned owls are listed as either high interest or sensitive with the State of Utah and BLM. The golden eagle has added protection under the Bald and Golden Eagle Protection Act, as amended. All of these species could use the proposed PFSF site, areas along Skull Valley Road, and the Skunk Ridge railroad corridor for feeding areas. The only exception might be the short-eared owl, which would be more likely to use marsh and wetland areas to the north, such as Horseshoe Springs. Nesting sites have been identified for Swainson's and red-tailed hawks along Skull Valley Road. Burrowing owl nest burrows have been located along the proposed Skunk Ridge railroad corridor. Pairs of northern harriers and a single short-eared owl have been seen along the proposed Skunk Ridge railroad corridor, which indicates they may also breed in these areas (Stone & Webster 1998). Proposed mitigation measures to assure protection of these species are discussed in Section 9.4.2 of this FEIS.

Sandhill cranes (*Grus canadensis*) are a State of Utah conservation concern species that may occur in Skull Valley. Cranes use prairies, grasslands, fields, wetlands, and marsh areas (UDWR 1999; Chandler et al. 1983; National Geographic Society 1983) and are not expected to occur at the proposed PFSF site or along the proposed Skunk Ridge rail corridor.

Other birds mentioned by State and Federal agencies as potentially using the proposed PFSF site and Skull Valley area include the bobolink (*Dolichonyx oryzivoris*), common yellowthroat (*Geothlypis trichas*), Caspian tern (*Sterna caspia*), American white pelican (*Pelecanus erythrorhynchos*), Lewis' woodpecker (*Melanerpes*), and loggerhead shrike. Bobolinks use flooded grasslands and wet meadows in Skull Valley (e.g., wetland areas north of the proposed PFSF site, along Skull Valley Road). Common yellowthroats also use these wetlands (UDWR 1997b; UDWR 1999). Therefore, neither of these birds are expected to use areas associated with the proposed PFSF site, the rail corridor, or ITF. Caspian terns and American white pelicans would not be expected to use the proposed PFSF site or any transportation corridors (i.e., rail corridor or ITF). These birds nest on islands in the Great Salt Lake and then use freshwater wetlands for foraging (UDWR 1997b). The Lewis' woodpecker prefers open wooded areas and is not expected to use areas associated with the project. This woodpecker is a resident of the riparian habitats of the Uinta Basin, over 161 km (100 miles) east of Skull Valley (UDWR 1997b). The loggerhead shrike is a species known to nest in the saline lowlands of Skull Valley. Shrikes have been observed on the proposed PFSF site as well as along the Skunk Ridge corridor, and could be expected to occur along Skull Valley Road (Stone & Webster 1998).

Speckled dace (*Rhinichthys osculus*), mink (*Mustela vison*), and Great Basin spadefoot toad are State protected species (UDWR 1997a). According to UDWR, speckled dace and mink use wetland areas along Skull Valley Road, to the north of the proposed PFSF site and are not expected to use areas associated with the proposed PFSF site. The Great Basin spadefoot toad has been identified to the south of the proposed PFS site and could be present in certain seasonal drainages that occur along the Skunk Ridge railroad corridor (Stone & Webster 1998; UDWR 1997a).

A State-listed high interest snail, swamp lymnaea *(Lymnaea stagnalis),* is known to exist in wetlands south of the proposed PFSF site. The snail could occur in wetlands along Skull Valley Road but is not expected to use areas associated with the proposed PFSF site (UDWR 1997a; Stone & Webster 1998).

3.5 Socioeconomic and Community Resources

This section describes such socioeconomic characteristics and community resources as population, employment, and housing. It discusses the availability of services (such as schooling and housing) in those surrounding communities that would be likely to attract any temporary or permanent work force. The socioeconomic conditions of the Skull Valley Band are discussed first, followed by a discussion of the socioeconomic conditions in areas surrounding the Reservation.

The proposed PFSF site and the alternative site are in the northwest section of the Reservation. The Reservation, itself, consisting of approximately 7,530 ha (18,600 acres), is situated in the east-central portion of Tooele County. The Skull Valley Road travels north-south through the Reservation, connecting to Interstate 80, which travels east into Salt Lake City.

3.5.1 The Reservation

The Reservation is located in a remote area approximately 56 km (35 miles) south of the Great Salt Lake. The Reservation is in a semi-arid valley, and a portion of the Wasatch-Cache National Forest borders the Reservation on the east. Reservation land is suitable for grazing. About 65 ha (160 acres) of Reservation land are irrigable. Stream water is delivered to the irrigable lands through an existing pipeline.

The Skull Valley Band is culturally and economically similar to the Western Shoshone and speaks Shoshone. The Skull Valley Band has an enrollment of approximately 120 members, with about 30 members of the Skull Valley Band residing on the Reservation. The majority of these members are under the age of eighteen. The balance of the enrollment resides in outlying areas within the State of Utah or out-of-state. Some adult members residing on the Reservation are employed off the Reservation in nearby communities working with the agriculture, forestry, and fisheries classes of industry (PFS/RAI1 1999).

The majority of the Skull Valley Band members that do not reside on the Reservation are employed in Salt Lake City, Grantsville, Stockton, Tooele, and Ibapah. These members are employed in various positions including artisans, nurses, and construction workers. Several of the enrolled membership living off the Reservation have expressed interest in returning to the Reservation if jobs and housing were available (PFS/RAI1 1999).

The average household income of the Skull Valley Band members living on the Reservation is approximately $20,000 per year (PFS/RAI1 1999). About 17 individuals living on the Reservation are noted as members of households having income below the national poverty level (includes individuals living on the Reservation who are not Skull Valley Band members, such as spouses) (PFS/RAI1 1999).

The school-age children on the Reservation attend classes at the school located in the Town of Dugway (PFS/ER 2001). Approximately 10 percent of the enrolled membership have 2 or 4-year degrees from post-secondary educational institutions. The Skull Valley Band has an ongoing tuition assistance program that has limited capability due to insufficient financial resources (PFS/RAI1 1999).

Health care is provided by the Indian Health Service Uintah and Ouray Service Unit in Fort Duchesne, 510 km (320 miles) from the Reservation. Hospital care is provided through the Indian Health Service

Contract Health Program in Tooele. The Indian Health Service has not provided data requested to characterize the health status of the Skull Valley Band.

The Skull Valley Band has no natural resources other than the land itself, and has pursued economic development projects that are consistent with the numerous waste processing and testing facilities that surround the Reservation. Until 1995, about 90 percent of their income to fund programs came from the lease of the Tekoi Rocket Testing Facility on the Reservation. This lease has recently expired and has not been renewed.

Through an annual budgeting process, the Skull Valley Band allocates all financial resources for the betterment of their living conditions (PFS/RAI1 1999). Many of the activities conducted on the Reservation, including maintenance and operation of the Pony Express Convenience Store, which sells convenience groceries and gasoline to Skull Valley Band members and passers-by on Skull Valley Road, and the operation of Tribal governance, are currently staffed with volunteers due to the lack of financial resources. Three volunteer staff members, including one Skull Valley Band member from the Reservation, one individual married to a Skull Valley Band member, and one person who is not a member of the Skull Valley Band, operate the store. Income derived from the store is deposited into the Tribal general account (PFS/ER 2001). Tribal government is in the process of developing financial strategies to provide for the long-term financial security and improvement in the standard of living for enrolled Skull Valley Band members from their business ventures (PFS/RAI1 1999).

Utility infrastructure on the Reservation is limited. Included are a community building, storage shed, water shed, water tank, and a small reservoir. The types of utilities available include Skull Valley Band water (three drilled wells), individual septic systems, electricity provided by Utah Power, telephone service, and propane provided by Amerigas (PFS/ER 2001).

The Skull Valley Road passes through the Reservation approximately 2.4 km (1.5 miles) from the proposed PFSF site (see Figure 2.1). Traffic on this roadway is primarily related to local resident travel and travel between Interstate 80 and the Dugway Proving Ground. Average daily traffic on Skull Valley Road past the Reservation in 1995 was approximately 325 vehicles per day (Utah Department of Transportation 1995).

3.5.2 Tooele County and Communities

3.5.2.1 Land Use

The principal land uses in Skull Valley are rangeland for livestock grazing (agriculture) and recreation. For both of these activities, much of the land used for these purposes is administered by the BLM. Much of the remainder of the land is split between the Reservation and private ownership, with some land owned by the State of Utah. The following discussion describes land ownership and land use for the impact area.

Many areas of Tooele County are undeveloped and somewhat isolated. Most land in the County is under the administration of the BLM and the U.S. Department of Defense (including Dugway Proving Ground, the Utah Test and Training Range (UTTR), and Tooele Army Depot and Deseret Chemical Depot), and a significant portion of the county is actively used for hazardous waste incineration and storage (at the USPCI, Aptus, and Envirocare facilities) (see Figure 1.1). The Dugway Proving Ground includes about 340,000 ha (840,000 acres), with its nearest border about 24 km (15 miles) southwest of the proposed PFSF site. It is a U.S. Army multipurpose facility that tests chemical and biological defense systems.

Skull Valley is adjacent to the UTTR which includes 19,000 square miles (about 12 million acres) of restricted airspace in northern Utah. The proposed PFSF site is located within the northern boundary of the Sevier B military operating area (MOA), which is utilized by military aircraft in training and in traveling to and from the UTTR and Hill Air Force Base (see Figure 1.1).

Mineral extraction interests are active near the Great Salt Lake and in the mountainous areas of the county. The military and hazardous waste industries have located in the county from throughout the nation, as have mineral extraction interests (Gillies Stransky Brems Smith Architects 1995).

Table 3.5 shows the percentage of Tooele County that has been farmland since 1982. Although the county is not heavily agricultural (i.e., much of the county is administered by Federal agencies) and the proportion of land dedicated to farming has declined over the last fifteen years, agriculture still plays an important role in the local economy (see Section 3.5.2.3). To put the agricultural character of the county in perspective, approximately 42 percent of U.S. land overall is in farms compared with 6.6 percent in Tooele County (U.S. Dept. of Agriculture 1999).

Table 3.5. Land in farms in Tooele County

	1982	1987	1992	1997
	Hectares (acres)	**Hectares (acres)**	**Hectares (acres)**	**Hectares (acres)**
Total land area	1,799,000 (4,445,400)	1,799,000 (4,445,400)	1,799,000 (4,445,400)	1,799,000 (4,445,400)
Land in farms	204,642 (505,681)	197,255 (487,427)	176,944 (437,238)	117,862 (291,238)
Percent of total land area that is farmland	11.4	11.0	9.8	6.6

Sources: U.S. Bureau of the Census 1992. *1992 Census of Agriculture* and the U.S. Department of Agriculture 1999. *1997 Census of Agriculture*

Land ownership and administration within Skull Valley includes the Reservation, the Dugway Proving Ground (military), Wasatch-Cache National Forest, the BLM, the State of Utah [approximately 10,120 ha (25,000 acres)], and privately owned ranches and residential areas. The privately owned ranches consist of about 28,328 ha (70,000 acres), and the Reservation is approximately 7,530 ha (18,600 acres). Most of the land in Skull Valley is administered by the BLM, which leases much of its land for grazing.

With the exception of the Reservation and other lands under the domain of Federal agencies, land in Skull Valley is controlled by Tooele County zoning. The Tooele County General Plan (Gillies Stransky Brems Smith Architects 1995) defines six planning districts: Tooele Valley, Rush Valley, West Desert, I-80 Corridor, Ibapah-Gold Hill, and Skull Valley.

The Skull Valley planning district stretches from its northeast corner just south of Timpie to the southern border of Tooele County. Within this area, most of the land is zoned as "multi-use." However, along the Skull Valley Road there are significant land areas zoned as "agricultural" which requires a minimum lot size of 16.2 ha (40 acres). Permitted uses in Multiple Use and Agricultural Districts include agricultural uses, construction of single and two-family homes, recreation facilities and storage of agricultural equipment. The Wasatch-Cache National Forest is a significant part of the Planning District and starts about 8 km (5 miles) to the east of the Skull Valley Road, extending southward for about 32 km (20 miles) and ending just north of Highway 199.

Within an 8-km (5-mile) radius of the proposed PFSF, there are approximately 5,263 ha (13,000 acres) of Reservation land, 3,644 ha (9,000 acres) of privately owned land, and 11,336 ha (28,000 acres) of public land administered by the BLM (PFS/ER 2001). The Skull Valley Band village and two private ranches are within this radius. Two private ranches, on Skull Valley Road, are approximately 4.8 km (3 miles) and 6.4 km (4 miles) northeast of the proposed PFSF (PFS/ER 2001). Cattle grazing on a small part of the Reservation is a future possibility (PFS/RAI1 1999).

The BLM land within the 8 km (5 miles) radius is part of the Skull Valley and South Skull Valley grazing allotments and includes three pastures (West Cedar, Eightmile, and Black Knoll). The southeast corner of the Black Knoll Pasture is within the 8 km (5 miles) radius. Two operators are authorized to graze up to 5,000 sheep and 2,300 cattle within the Skull Valley allotment from November 1 to April 30. Sheep graze in alternate years. Cattle graze following a 3-year cycle: in year one they graze from November 1 to April 30; in year two they graze from November 1 to February 28; and in year three they graze from April 1 to April 30. The potential rail line from Skunk Ridge to the proposed PFSF would cross the Eightmile and Black Knoll Pastures. Portions of two pastures in the South Skull Valley allotment are within the 8 km (5 miles) radius of the site: the east end of the Cochrane Pasture and the north edge of the Post Hollow Pasture. The permit holder for these pastures is authorized to graze a maximum of 700 cattle and 3,800 sheep from November 1 to April 30 in alternating years (PFS/ER 2001).

In summary, the Skull Valley area in general and the area surrounding the proposed PFSF are characterized by open space and are generally undeveloped with mostly limited grazing and agricultural uses. The opportunity for expansion of existing uses in the valley is limited due to the lack of accessible private land in the valley or along the Skull Valley Road corridor. In addition, because of the valley's limited population, services, and infrastructure, significant future growth in commercial or industrial uses seems unlikely (Gillies Stransky Brems Smith Architects 1995).

3.5.2.2 Population

Aside from the Reservation, which has a residential population of about 30, residential populations in Skull Valley include about 30 households in the unincorporated town of Terra and 11 households in the rest of the valley. Assuming a persons per household value of 2.87 (Governor's Office of Planning and Budget 1997), this represents a total non-Reservation population of approximately 120 persons within Skull Valley; combining Reservation and non-Reservation populations results in a total of approximately 150 persons within Skull Valley. The households in Terra are located there primarily due to employment at the Dugway Proving Ground and the remaining residences are related to ranching and agricultural activities. The Town of Dugway, located 21 km (13 miles) south of the proposed PFSF, with a population of about 1,800 (PFS/ER 2001), is just outside the Skull Valley Planning District; however, Dugway's on-site residences and employment are important sources of traffic on Skull Valley Road.

Tooele County's population is approximately 33,351 (1998), and approximately 16,748 people live in its largest city, Tooele (1998). The county's average annual growth rate of approximately 2.9 percent through the 1990s is higher than the State's average of 2.1 percent. By 2020, the population is projected to surpass 59,000. Tooele County has the second largest land area in the State, but a relatively low density of 4.8 people per square mile estimated in 1998 (Governor's Office of Planning and Budget, Demographic and Economic Analysis, http://www.governor.state.ut.us/dea/rankings/county/densitygh.htm), as compared with a density of approximately 25.4 persons per square mile estimated in 1998 for the State as a whole (Governor's Office of Planning and Budget, Demographic and Economic Analysis, http://www.governor.state.ut.us/dea/rankings/county/popgh.htm).

Table 3.6 shows current populations and recent changes in population for Tooele County and incorporated areas within Tooele County. No official population counts are available for the Skull Valley portion of Tooele County itself. Table 3.7 provides additional historical data regarding population in Tooele County. Projections of future population for Tooele County and incorporated areas within Tooele County are provided in Table 3.8.

No transient or institutional populations are present within 8 km (5 miles) of the proposed PFSF. During October 1996, a survey was conducted to identify existing and planned public facilities and institutions within an 8 km (5 miles) radius of the facility. Due to the remoteness and extremely low population density of the area [36 persons within an 8 km (5 miles) radius of the proposed PFSF], no public facilities such as hospitals, prisons, parks or designated recreational areas are located or planned within that radius (PFS/ER 2001).

3.5.2.3 Employment and Economic Resources

This section describes the local economy and presents the relevant unemployment statistics for the area. The nature of the local workforce is also presented in light of the potential need for workers at the proposed PFSF.

Tooele County's 1995 per capita income was approximately $14,800. This is lower than the State average of $18,226. The county's 1996 unemployment rate, at 5.3 percent, was higher than the State's 3.5 percent that same year.

As of 1996, there were approximately 10,650 employees in the Tooele County labor force. As demonstrated in Table 3.9, total employment in Tooele County has remained fairly stable over the last 15 years, as has the unemployment rate.

As demonstrated in Table 3.10, government provides more jobs, by far, than any other source of employment in the county, although the proportion of government jobs to total jobs has declined substantially over the last 15 years. The major employers for Tooele County, as of 1996, were

Table 3.6. Population in Tooele County and incorporated areas

City	1990	1991	1992	1993	1994	1995	1996	1997	1998
Grantsville	4,500	4,633	4,723	4,821	4,920	4,998	5,198	5,304	5,528
Ophir	25	25	25	26	27	29	30	32	34
Rush Valley	339	347	349	352	357	365	367	369	375
Stockton	426	433	438	444	457	460	467	478	497
Tooele (city)	13,887	14,094	14,274	14,454	14,716	14,830	14,996	15,711	16,748
Vernon	181	185	186	190	197	198	199	198	202
Wendover	1,127	1,122	1,124	1,145	1,167	1,178	1,190	1,216	1,258
Balance of Tooele County	6,116	6,225	6,322	6,536	6,919	7,255	7,649	8,157	8,709
Tooele County Total	26,601	27,064	27,441	27,968	28,760	29,313	30,096	31,465	33,351

Source: U.S. Bureau of the Census, *Subcounty Population Estimates, 1990–1998*. Washington, D.C., July 1999.

Table 3.7. Historical population data for Tooele County

Category	1940	1950	1960	1970	1980	1990
Total population (July 1)	9,133	14,636	17,868	21,545	26,033	26,601
Percent change from previous value	N/A	60.3	22.1	20.6	20.8	2.2

Source: U.S. Bureau of the Census, *Population of Counties by Decennial Census: 1900–1990*.

Table 3.8. Population projections for incorporated areas in Tooele County

Area	1999	2000	2001	2002	2003	2010	2020
Grantsville	6,160	6,459	6,771	7,099	7,324	9,144	11,470
Ophir	33	34	34	35	37	42	54
Rush Valley	406	433	461	491	506	652	751
Stockton	543	567	592	618	637	794	991
Tooele (city)	16,907	17,386	17,879	18,387	18,971	20,452	26,252
Vernon	206	220	234	249	257	294	372
Wendover	1,378	1,363	1,348	1,333	1,375	1,302	1,922
Balance of Tooele County	8,981	8,819	8,658	8,551	8,823	13,794	17,866
Total	34,615	35,280	35,977	36,762	37,931	46,474	59,678

Source: Governor's Office of Planning and Budget—Demographic and Economic Analysis Section, UPED Model System, 1997 Baseline Projections (12/17/96)

Table 3.9. Employment and income for residents of Tooele County

Category	1980	1985	1990	1995	1996
Labor force	11,489	11,697	12,275	11,040	11,243
Employed	10,838	10,991	11,667	10,418	10,651
Unemployed	651	706	608	622	592
Unemployment rate (percent)	5.7	6	5	5.6	5.3
Per capita income	$7,968	$10,966	$13,378	$14,772	N/A

Source: Governor's Office of Planning and Budget, Demographic and Economic Analysis, Historical data: Tooele County (http://www.qget.state.ut.us/county/scripts/County)

Table 3.10. Employment by economic sector in Tooele County

Economic sector	1980	1985	1990	1995	1996
Manufacturing	1,095	1,173	1,008	1,050	1,183
Mining	885	322	229	213	216
Construction	269	322	391	605	669
Transportation, communications and public utilities	247	218	256	1,301	1,694
Trade	962	1,204	1,335	1,599	1,715
Finance, insurance and real estate	167	157	134	171	192
Services	749	996	1,265	1,431	1,572
Government	5,752	6,224	5,939	3,458	3,279
Non-farm proprietors	1,001	1,345	1,505	1,895	2,020
Total employment	11,520	12,355	12,434	12,091	12,918

Source: Governor's Office of Planning and Budget—Demographic and Economic Analysis Section.
UPED Model System 1997 Baseline Projections (12/17/96). The last year of historical data is 1995 for employment and 1996 for population.

Agriculture in Tooele County in 1997 occurred on 332 farms and covered approximately 117,862 ha (291,238 acres) of land. Important commodities are wheat, barley, hay, and cattle. As discussed in Section 3.5.2.1, much of the land used for grazing purposes derives from allotments from the BLM. Table 3.11 provides information related to agricultural activity in Tooele County.

In summary, the economy of Tooele County consists of several ?mini" economies. The more remote, rural areas are resource-based economies that rely on agriculture, ranching, and mineral extraction, while the more developed and populous Tooele Valley is more multi-dimensional with active roles played by manufacturing, retail and wholesale trade, and government sectors (PFS/ER 2001).

Natural resources, particularly the lack of water resources, will always serve as a limitation to potential growth in the more remote areas of the county (Gillies Stransky Brems Smith Architects 1995).

Table 3.11. Agricultural activity in Tooele County

	1982	1987	1992	1997
Farms (number)	304	299	300	332
Average size of farm (acres)[a]	1,663	1,630	1,457	879
Irrigated land (acres)	21,570	18,972	16,479	18,944
Cattle and calves inventory (number)	27,277	24,350	18,652	20,051
Sheep and lambs inventory (number)	20,414	30,755	21,054	7,908
Crops in production:				
Corn (tons, green)	2,530	4,098	3,879	2,830
Wheat (bushels)	52,252	141,221	35,180	50,675
Barley (bushels)	167,977	128,324	90,806	90,589
Oats (bushels)	11,739	13,261	5,765	4,021
Hay (including alfalfa) (tons, dry)	50,832	33,230	33,812	47,818

[a]1 acre - 0.40469 ha.
Source: U.S. Department of Agriculture, National Agricultural Statistics Service, *1997 Census of Agriculture*.

3.5.2.4 Community Resources

Information on community resources (including utilities, public services, housing, schools, and transportation) in Tooele County is presented and discussed in this section. Details related to the Reservation are presented in Section 3.5.1

Utilities. Utility infrastructure in Skull Valley is very limited. In the more populated parts of Tooele County (e.g., Tooele Valley, Rush Valley), there is an established infrastructure that provides potable water, sanitary sewer, natural gas, and electrical service. The entire county is served by electrical power and telephone service; natural gas and cable television are only available in the Tooele Valley area where the population density is higher (PFS/ER 2001).

Drinking water in Tooele County originates from well or spring sources. Most of the incorporated areas and military installations provide central water systems and operate well systems, providing water for potable uses as well as industrial use and fire protection. In the rural areas, individual wells provide potable water for farm and ranch operations and homes. Water use in Skull Valley itself is limited to servicing human consumption needs, limited irrigation for the growth of cattle feedstock crops along Skull Valley Road, and drinking water for the livestock itself over the grazing areas (PFS/RAI1 1999).

The only centralized wastewater systems serving the county are located in Tooele, Grantsville, Lake Point, Stansbury Park, Wendover, and at the military facilities at Tooele Army Depot and Dugway Proving Ground. The rest of the county is served by individual septic tank systems. The septic tank systems have worked relatively well, but in areas of shallow groundwater some failures have occurred (PFS/ER 2001).

Electrical power is provided to virtually the entire county. Service is limited in more rural areas and is generally located along public roads. Power lines cross through the county to serve other areas. Telephone service is also available throughout the county, with U.S. West providing service to the eastern, more densely populated party of the county and smaller systems serving more rural areas (PFS/ER 2001).

Natural gas service is provided to the eastern part of the county. In other areas, service is not provided due to the economics required to extend service lines to customers (PFS/ER 2001). However, propane is provided to other areas by Amerigas.

The management and disposal of solid waste has traditionally been provided by the county to all residents. Historically, the county has operated a solid waste landfill where all collected wastes have been deposited. The county has recently closed its old facilities and has developed a new facility for recycling, composting, and conditioning waste that complies with all current regulations (PFS/ER 2001).

Public health and safety. The Tooele County Fire District is a volunteer fire department that provides service in an area extending from Stockton to the Great Salt Lake and from the eastern county line westward to Interstate 80 mile marker 45. When necessary, the department responds to emergencies throughout the remainder of the county (PFS/ER 2001).

Health and emergency services, including the Tooele Regional Medical Center, Home Health and Nursing Home operations, and the Tooele Valley Ambulance Service, are located in Tooele Valley in the incorporated areas of Grantsville, Tooele, and Vernon. The medical center offers surgery, emergency, laboratory, and special medical care and testing (PFS/ER 2001). More extensive health care services are offered in Salt Lake City.

The Tooele County Sheriff's Department responds to accidents and crime throughout the county, while city police departments serve the communities of Tooele, Grantsville, Stockton, and Wendover (PFS/ER 2001).

Housing. Key housing data for Tooele County and incorporated areas in the impact area are provided in Table 3.12. This information, which comes from the 1990 decennial census, is the latest complete set available for the jurisdictions under study. The proportion of housing units occupied by renters varied from a low of approximately one-fifteenth in the towns of Cedar Fort and Rush Valley to 100 percent in Dugway and just over one-half in Wendover. If one discounts Dugway and Wendover as sources of potential housing for the proposed action (because housing in Dugway is restricted to employees of Dugway Proving Ground and Wendover is relatively far from the proposed site), the incorporated areas with the greatest absolute number and proportion of renter-occupied housing units are Grantsville and Tooele City. The median value of an owner-occupied unit was lowest in Stockton, and the median rent was lowest in Ophir. The median value of a home was highest in Rush Valley, and, discounting Dugway (see above), the rent was the highest in Tooele. In all of Tooele County, there were 147 vacant units for sale and 413 units for rent in 1990. Table 3.13 shows substantial growth in residential development in recent years that may indicate greater housing capacity than indicated by the information displayed in Table 3.12.

Education. The Tooele County School District offers education throughout the county. It includes 19 public schools (including schools for students of employees at Tooele Army Depot and Dugway Proving Ground) as well as an adult education center. As of October 1998, there were approximately 8,170 students enrolled in district schools. Table 3.14 provides information regarding the enrollment at each of the district's schools. The student/teacher ratios for schools in the Tooele County School District average approximately 22.6, with the lowest ratios being found in grades seven and eight (19.6 students per teacher) and the highest being found in sixth grade (25 students per teacher) (Tooele County School District 1999).

During 1998–99, the Tooele County School District added over 76,000 square feet of new classroom space, with a new elementary school in Wendover and twenty new classrooms at East Elementary School and Stansbury Park Elementary School, and a multi-purpose room at Harris Elementary School. These projects were completed as a result of a $10 million bond issue approved by voters in the district in 1996. The Tooele School District projects an increase of more than 40 percent new growth in the next 10 years and, based on this new growth, substantial additional capacity will be required, including a new elementary school in Grantsville, additional elementary schools in Tooele, Stansbury and Erda, an additional middle school and high school in Tooele, Stansbury, and Erda, and additions to the Grantsville high school and middle school (Tooele County School District 1999).

Table 3.12. 1990 housing data for Tooele County and incorporated areas

Location	Number of occupied housing units	Percent of units occupied by owner	Percent of units occupied by renter	Number of vacant housing units	Number of vacant units for sale	Number of vacant units for rent	Median value of owner-occupied unit ($)	Monthly median rent ($)
Grantsville	1,376	77.9	22.1	96	18	26	57,600	238
Ophir	13	69.2	30.8	17	0	0	55,000	99
Rush Valley	112	92.9	7.1	25	4	1	61,700	192
Stockton	133	87.2	12.8	15	3	2	43,300	225
Tooele	4,842	74.5	25.5	348	102	113	59,800	289
Vernon	57	87.7	12.3	14	0	2	52,900	213
Wendover	294	45.2	54.8	54	4	43	55,000	246
Tooele County	8,581	70.2	29.8	929	147	413	60,400	292
Cedar Fort	77	93.5	6.5	7	1	1	58,200	175
Dugway	466	0.0	100.0	164	0	163	NA	366

Source: U.S. Bureau of the Census 1991

Table 3.13. Building permits in Tooele County

Category	1980	1985	1990	1995	1996	1997	1998
Residential building permits	107	126	74	271	323	1,013	1,012

Source: Governor's Office of Planning and Budget, Demographic and Economic Analysis, Historical data: Tooele County (http://www.qget.state.ut.us/county/scripts/County).

Table 3.14. Educational resources in the Tooele County School District (Fall 1997)[a]

School	Location	Grades	Number of students
Kindergarten and elementary schools			
Anna Smith Elementary School	Wendover	K–6	264
Dugway Elementary School	Dugway	K–6	154
East Elementary School	Tooele City	K–6	585
Grantsville Elementary School	Grantsville	K–5	758
Ibapah Elementary School	Ibapah	K–6	25
Northlake Elementary School	Tooele City	K–6	755
Stansbury Park Elementary School	Stansbury Park	K–6	673
Sterling R. Harris Elementary School	Tooele City	K–6	527
Vernon Elementary School	Vernon	K–6	29
West Elementary School	Tooele City	K–6	604
Middle and junior high schools			
Grantsville Middle School	Grantsville	6–8	527
Tooele Junior High School	Tooele City	7–8	729
Ibapah Middle School	Ibapah	7–8	8
High schools			
Dugway Junior-Senior High School	Dugway	7–12	151
Grantsville High School	Grantsville	9–12	800
Tooele High School	Tooele City	9–12	1,505
Tooele Valley High Alternative School (home study)	Tooele Army Depot	10–12	103
Wendover Junior-Senior High School	Wendover	7–12	187
Oquirrh Hills School	Tooele City	ungraded	4

[a]There were also 350 students at the Tooele Adult Education Center and 77 students in preschool at Harris Elementary, Grantsville Elementary, and the Oquirrh Hills Early Learning Center enrolled as of October 1, 1998.

Source: Tooele County School District 1999.

Transportation. The Skull Valley Road passes through the Reservation approximately 2.4 km (1.5 miles) from the proposed PFSF (see Figure 2.1). Traffic on this roadway is primarily related to local resident travel and travel between Interstate 80 and the Dugway Proving Ground. Table 3.15 provides information related to traffic on roads potentially affected by the proposed action. Table 3.16 provides information depicting monthly and daily variation in traffic on Interstate 80.

Table 3.15. Traffic on highways potentially affected by the proposed action

Road[a]	Road segment	Road segment length in miles (km)	1995 average daily traffic	1997 average daily traffic[b]
Skull Valley Road	Junction SR 199 at Dugway Proving Ground to Iosepa	21.3 (34.3)	325	NA
	Iosepa to Interstate 80 at Timpie Waterfowl Area	15.3 (24.8)	565	NA
Interstate 80	Lakeside interchange to Delle interchange [11.2 km (7 miles) west of Skull Valley Road]	6.9 (11.1)	7,790	NA
	Delle interchange to Rowley interchange (at Skull Valley Road)	7.0 (11.3)	8,600	8,000
	Rowley interchange to Stansbury interchange [11.2 km (7 miles) east of Skull Valley Road]	5.1 (8.1)	8,760	8,495
	Stansbury interchange to Burmester interchange	10.3 (17.1)	8,900	9,014
	Burmester interchange to Tooele interchange	2.6 (4.2)	25,335	NA
SR 36	North incorporated limits of Vernon to junction SR 199	3.7 (6.3)	1,655	1,715
	Junction SR 199 to junction SR 73	4.9 (7.9)	3,315	NA
	Junction SR 73 to north incorporated limits of Stockton	4.0 (6.4)	4,080	NA
	North incorporated limits of Stockton to junction local road to Tooele Army Depot	1.1 (1.8)	9,160	NA
	Junction local road to Tooele Army Depot to south incorporated limits and south urban boundary of Tooele	1.3 (2.1)	8,745	NA

Table 3.15. Continued

Road[a]	Road segment	Road segment length in miles (km)	1995 average daily traffic	1997 average daily traffic[b]
	South incorporated limits and south urban boundary of Tooele to 300 South in Tooele	0.5 (0.8)	15,885	NA
	300 South in Tooele to Vine Street in Tooele	0.3 (0.5)	23,335	NA
	Vine Street in Tooele to 100 North SR 112	0.3 (0.5)	21,725	NA
	100 North SR 112 to north incorporated limits of Tooele	2.3 (3.7)	11,295	NA
	North incorporated limits of Tooele to north urban boundary of Tooele	5.8 (9.3)	10,155	NA
	North urban boundary of Tooele to junction SR 138 Mills Junction	2.7 (4.3)	10,950	NA
	Junction SR 138 Mills Junction to truck stop service center Interstate 80	0.6 (1.0)	12,300	NA
SR 138	Interstate 80 to east incorporated limits of Grantsville	6.8 (10.9)	5,805	1,260
	East incorporated limits of Grantsville to west incorporated limits of Tooele and junction with SR 36	1.7 (2.7)	6,810	6,245
SR 199	Dugway Proving Ground East Gate to junction with Skull Valley Road	8.1 (13.0)	675	725
	Junction with Skull Valley Road to Terra	9.3 (15.0)	850	915
	Terra to local road	4.1 (6.6)	890	NA
	Local road to junction SR 36	0.7 (1.1)	1,355	NA

[a]SR = State road
[b]NA = Not available

Source: Utah Department of Transportation, *1995 Traffic on Utah Highways* (traffic.pdf) (obtained from: http://www.sr.ex.state.ut.us/html/site_documents.htm), and PFS/RAI1 1999.

Table 3.16. Monthly and daily traffic on I-80, east of Delle Interchange

Month	Average per day Sunday through Saturday	Average per day Monday through Friday	Month daily average as percent of the year daily average
	I-80, east of Delle Interchange		
January	5,880	5,186	75.5
February	6,566	5,658	84.3
March	7,035	6,307	90.3
April	7,513	6,573	96.5
May	7,996	7,345	102.7
June	9,012	8,430	115.7
July	9,823	9,139	126.1
August	9,686	9,043	124.4
September	8,447	7,746	108.4
October	8,502	7,761	109.2
November	6,654	6,398	85.4
December	6,250	6,106	80.2
Daily average for year	7,789	7,156	Not available

Source: Utah Department of Transportation, *1995 Traffic on Utah Highways* (traffic.pdf).

3.6 Cultural Resources

3.6.1 Cultural Background

The region of the proposed action is rich in prehistoric and historic period Native American and historic period Euro-American cultural resources. Human occupation and use of this part of Utah can be placed into several sequential chronological periods, summarized in Table 3.17. Basic references for the historic period background of Skull Valley and environs include Bluth (1978), Blanthorn (1998), and various chapters in Miller (1990); other references that deal more directly with specific cultural resource projects or individual cultural properties are cited in the following sections.

3.6.2 Archaeological, Native American, and Historic Properties

3.6.2.1 Archaeological Properties

A number of previous archaeological field surveys have been completed in the Skull Valley area. All of these efforts have been completed in response to Federal agency projects requiring cultural resource clearances, such as BLM land exchange parcels (e.g., Christensen 1989; Melton 1998a), fire rehabilitation projects (Melton 1998b), or private projects that require the use of Federal or State

Table 3.17. Generalized cultural sequence for the region including Skull Valley

Cultural period	General timeframe	General characteristics
Paleoindian	10,000–7,000 B.C.	Marked by the presence of large, fluted projectile points, often associated with late Pleistocene/early Holocene beaches. Economic reliance on larger game animals, with exploitation of other resources including marshes and lacustrine areas.
Archaic	7,000 B.C.–A.D. 400	Shift in economic focus toward a greater dependence on seeds and plant foods. Settlement and subsistence patterns characterized by exploitation and movement over several ecological zones.
Late Prehistoric/ Fremont	A.D. 400–1300	Marked by a change in subsistence to horticulture, with increased reliance on smaller game animals, semisedentary or sedentary villages, and changes in material culture, including basketry, pottery, and milling implements. Five regional Fremont variants are recognized in the eastern Great Basin; Skull Valley is near the boundary of two: the Great Salt Lake Fremont to the north and the Sevier Fremont to the south.
Protohistoric/Numic	A.D. 1300–Contact[a] with European people	The expansion of the Numic-speaking peoples into the region and the disappearance of the Fremont groups characterize this period. Economic and settlement patterns based on seasonal exploitation of plant and animal resources over a culturally defined territory.
Euro-American	About 1820–present	Initial contact by explorers and surveyors in the early 1800s, followed by emigrants using several trails through Utah, and eventually Mormon colonization and settlement of the region. Euro-American presence in Skull Valley marked by transportation routes and sparsely populated ranching activities.
Historic Native American	Contact[a] with European people–present	In historic times, the general area was homeland to several Western Shoshone Gosiute[b] groups who occupied Tooele, Rush, Skull, and Deep Creek Valleys. 1863 Treaty between Gosiutes and U.S. eventually led to establishment of Reservations at Deep Creek and Skull Valley.

[a]"Contact"—means when the Native Americans were contacted by the European Advance (traders, advancing homestead).

[b]"Gosiute" is a historical spelling of the modern-day "Goshute."

lands. Examples of the latter projects that have occurred in Skull Valley include proposed utility corridors, including power line (Nielson 1992; Nielson and Southworth 1992), fiber optic (Billat et al. 1986), road (Talbot 1989), and pipeline (Senulis 1987) rights-of-way and seismic exploration lines (Birnie and Newsome 2000). In addition to the recording of archaeological properties, several of these projects also recorded historic period properties. Historic sites are discussed in Section 3.6.2.3.

Although few of these inventories encroach on the proposed PFSF project area, the potential does exist for prehistoric sites to occur in Skull Valley, since several sites have been previously identified. Because of the location of many of these past cultural resources projects in the eastern side of the valley, either all or sections of the Skull Valley Road have been inspected on three different occasions. Most of these occur at the springs along the eastern boundary of the distinctive mud flats, in the center of the northern portion of the valley (e.g., Burnt, Muskrat, Horseshoe and Kanaka; see Figure 3.8), or in the vicinity of the higher, more sheltered locations, such as around Delle, Lone Rock and Round Knoll. Most of these archaeological properties are comprised of former campsites with associated artifact scatters.

The major archaeological survey work on the floor of Skull Valley was conducted by the BLM as part of the Dan Freed land exchange that totaled nearly 8,400 acres and is situated north of the Reservation. Cultural resource surveys located 37 prehistoric archaeological sites in these parcels (Christensen 1989), most of which are classified as small scatters of lithic artifacts. Some larger campsites were located, along with three rockshelters and a cave that had been occupied in prehistoric times. While none of these archaeological properties is located in the proposed PFSF project area, the results are indicative of the potential for archaeological resources in the valley. One of the BLM sites, 42TO504, an extensive campsite locality with a surface scatter of stone and ceramic artifacts, was excavated (Smith 1994). This archaeological site lies about 7 miles due north of the preferred site for the proposed PFSF (Site A, see Figures 1.3 and 2.1) on a long low ridge (a linear bar) adjacent to an old playa. Analyses of the materials revealed that the site was probably associated with marsh resources, available at a time when the playa held water. Radiocarbon dates, the ceramics, and some corn remains combine to indicate that occupation of the site dated to the early-mid Fremont time period.

Cultural resources literature searches and field inventories have been completed for the Skull Valley alternative project features. Bright and Schroedl (1998) conducted a Class I (literature and site file coverage) inventory for the proposed ITF just west of Timpie, and the railroad corridor that runs from Skunk Ridge south along the western perimeter of the valley to the Reservation. Along the proposed rail line, the study area included a one-half mile-wide corridor, centered on the proposed alignment. No known prehistoric archaeological properties were identified at either of these project areas, although only a small fraction of the areas under review had received intensive field survey.

In May and June of 1999 and June 2000, cultural resource Class III (intensive field survey) studies were conducted at four project areas: (1) the ITF location, comprising about 40 acres about 1.8 miles west of Timpie Junction; (2) the Skunk Ridge transportation corridor from Interstate 80 southward to the Reservation (about 2,300 acres); (3) the proposed PFSF area (Sites A and B) and the site access road (about 1,000 acres) on the Reservation; and (4) an exploratory trench (about 6 acres), located along the northern base of Hickman Knolls on the Reservation (Birnie and Newsome 2000). The results of this survey confirmed that historic resources are present in the project area and resulted in the discovery and documentation of 12 sites, 16 isolated historic features, and 70 isolated artifacts or small, isolated artifact clusters. Of the 12 sites, 8 are considered eligible for inclusion in the *National Register* including the Hasting Cutoff (site 42TO709) which is part of the California National Historic Trail; U.S. Route 40 (site 42TO1409); the “New” Victory Highway (site 42TO1410); an old alignment of the Victory Highway (site 42TO1411); a late nineteenth- and early twentieth-century telegraph line (site 42TO1412); the Western Pacific Railroad (site 42TO1413); a segment of the Deep Creek Road, which may contain portions of the Beckwith Trail (site 42TO1416); and the Sulphur Spring or Eight-Mile Spring Road (site 42TO1417), which is part of the California National Historic Trail.

Only one other archaeological survey has been completed on the Reservation itself. In 1995, Talbot (1995) surveyed a 40-acre parcel located about 1 mile northeast of the Tribal village for a proposed reservoir. In addition to the ground coverage, archaeological monitoring was completed during digging of several geological drill and backhoe test trenches. No cultural resources were observed during this project. Just outside the Reservation boundary, about one-half mile west of Sites A and B, BLM archaeologists have completed cultural resources survey of over 2500 acres in a rehabilitation project following the 1998 Tekoi Fire (Melton 1998). No archaeological properties were encountered during this fieldwork.

3.6.2.2 Native American Properties

The Skull Valley and adjacent areas have historically been the homelands of the Gosiute (note "Gosiute" is a historical spelling of the modern-day "Goshute") People, a regional variant of the Great Basin Shoshone culture area (Malouf 1974; Steward 1938; Thomas, Pendleton and Cappannari 1986). Although the Gosiute peoples today occupy two Reservations—the one in Skull Valley and another to the west in Deep Creek—the entire Skull Valley falls within the original exclusively used and occupied Gosiute territory, as determined through litigation before the Indian Claims Commission (Indian Claims Commission, Docket 326, see Horr 1974). For the Reservation, Crum (1987) and Allen and Warner (1971) contain good histories of its historical development.

Early anthropological investigations among the Gosiute reveal the Indians' extensive familiarity with Skull Valley and the resources contained therein. Gathering information from a Skull Valley Gosiute of 76 years of age in the 1930s, who in turn relied on his wife's grandfather for information, Steward (1938, 1943) compiled much data, including listing and mapping of known historic villages in the valley. The former village locations include:

- A cave on the northern end of the Stansbury Mountains, near Timpie
- Haiyacawiyep, a winter village near the town site of Iosepa
- *Iowiba*, a winter village in the mountains, just east of the Reservation
- *Tiava*, another winter village on the present Reservation along Hickman Creek
- *Suhudaosa,* a winter village and dance site, located in the vicinity of the Orr Ranch, just south of the Reservation

Steward also notes that the area just south of Delle was the location of antelope drives, and that communal rabbit drives in Skull Valley were an important source of food. The Hickman Creek area where Steward (1938) documented the Goshute village of *Tiava* in the 1930s was also shown to be the location of a Native American settlement in the summer of 1871 (GLO Map 1871).

Ralph Chamberlin, another early 1900s scientist, collected a considerable amount of information from the Gosiute People, including plant names and uses (Chamberlin 1911), place names (Chamberlin 1913), and animal names (Chamberlin 1908). In Skull Valley, Chamberlin provides Gosiute names for many of the springs and creeks, along with other named places. Chamberlin gives Gosiute names and uses for several hundred plants and plant parts that are available throughout the Gosiute territory.

Within the proposed PFSF project area, no traditional cultural properties or usage of culturally important natural resources have been documented. Additionally, during the Section 106 consultation process with regional Federally Recognized Indian Tribes and other organizations, no traditional cultural properties were identified within the project area (see Section 1.5.5). According to Skull Valley Band responses on this topic, the same is generally true for Skull Valley as a whole (PFS/RAI1 1999). Traditional plants of value to the Skull Valley Band, such as sage and cedar, are sparse in the project area due to a lack of surface water, and are considered inferior to the same plants growing in the Stansbury Mountains east of the Reservation, and in the adjacent Tooele Valley. There are no known uses of traditional plants by other Federally Recognized Indian Tribes within Skull Valley.

3.6.2.3 Historic Properties

As a result of Euro-American encroachment into Skull Valley over the past 150 years, there are a number of historic properties throughout the valley, many of which have been formally recorded as cultural resources. The historic properties can be discussed in four broad categories: (1) transportation (trails, roads, and railroad related) sites; (2) communication (telegraph and telephone); (3) settlements; and (4) ranches and other sites.

Transportation. Several mid-19th century historic trails either traversed Skull Valley, or intersected the northern part of the valley as travelers skirted the southern boundary of the Great Salt Lake, all funneled through the Timpie area (DeLafosse 1994; 1998; Kelly 1996; Miller 1958). These are listed as follows:

- Jedediah S. Smith (1826–27)—crossed north to south through the western part of Skull Valley on his way to California
- John W. Gunnison and E. G. Beckwith (1853–54)—crossed from north to south along the western edge of the valley, crossing the Cedar Mountains at Beckwith Pass
- John C. Fremont (1845) and Howard Stansbury (1849–50)—both passed along the south part of the Great Salt Lake, through the northern part of Skull Valley
- Hastings Cutoff (1846–50)—opened by Lansford Hastings following the Fremont survey, this was Utah’s first significant emigrant trail and was used for a five-year period, including the well-documented and ill-fated Donner-Reed Party in 1846. Leaving the Timpie vicinity, this trail passed southward along the east part of Skull Valley, paralleling the Skull Valley Road of today and passing Burnt, Muskrat, and Horseshoe Springs, to the location of the future town site of Iosepa and later the Deseret Ranch. A little to the south of this location the trail turned northwest across the valley and skirted the worst of the mudflats extending southward from the Great Salt Lake (This stretch is known today as Hastings Road). Reaching the west side of Skull Valley at Redlum Spring, the trail went through Hastings Pass across the Cedar Mountains.

In 1851, the Overland Mail stage road was established through the southern part of Skull Valley, diverting much of the transcontinental traffic away from the project area (Fike and Headley 1979). A network of roads connecting the Hastings Cutoff in Skull Valley with the stage road was in place by 1871 and possibly much earlier (GLO Map 1971). A network of secondary roads serving local ranch traffic and possibly some long distance travel was established across northern Skull Valley by 1907 (GLO Map 1907).

In the early 1900s, the advent of automobile traffic created another travel opportunity through Skull Valley. In 1913 the Lincoln Highway Association established a highway from New York City to San Francisco (Hokanson 1988). West of Salt Lake City, the original route of this highway passed through Grantsville, turned south at Timpie and passed through Skull Valley along the current Skull Valley

Road alignment (Knowlton n.d.; Lincoln Highway Association-Utah Chapter n.d.). However, in 1919 a road was cut through the Stansbury Mountains, and the route was changed to go through Tooele, over the pass, and across the southern part of Skull Valley. Several past cultural resources inventories have been conducted along much or part of the Skull Valley Road. These inventories have recorded some prehistoric archaeological sites along the corridor, particularly in the section between Timpie and Iosepa. The Lincoln Highway itself has received little attention as a historic property. BLM archaeologists recorded a 1.6-km (1-mile) section of the road lying south of the Reservation as 42TO1077 (Melton 1998a).

Meanwhile, across northern Skull Valley, an automobile road was established running west from Timpie, following the route of the Western Pacific Railroad. It later was designated the Victory Highway, becoming a competing transcontinental highway. The Victory Highway was realigned and upgraded in 1926 (Petersen 1999).

The Lincoln-Victory Highway era came to an end with the construction of U.S. Highway 40, also following the railroad across northern Skull Valley. U.S. 40 brought in the era of hard surfaced crowned highway transportation. The highway was slightly realigned at least once before being replaced by the modern Interstate 80.

The Western Pacific Railway Company initially completed the present Union Pacific rail line that crosses the northern part of Skull Valley in 1906-07. Recent cultural resources inventories of utility corridors that parallel the railroad have recorded several historic sites (Billat et al. 1986; Nielson 1992). These sites, along with their *National Register* evaluations, include:

- Timpie Railroad Siding (42TO453)—evaluated as being potentially eligible for the *National Register*
- Historic buildings just north of Delle (42TO733)—not eligible
- Low Railroad Siding (42TO4550)— potentially eligible

Communication. The southern end of Skull Valley, along the Overland Stage Road, was the route of early communication endeavors including the Pony Express from 1860–1861 and the transcontinental telegraph from 1861–1869 (Fike and Headley 1979). Later, Western Union telegraph lines were established along both sides of the Western Pacific across northern Skull Valley (GLO Map 1915). Early telephone lines followed the same corridor.

Settlements. Aside from the village on the Reservation, the only permanent settlement to have located in Skull Valley is the town of Iosepa (1889–1917), a settlement of Hawaiian immigrants who had come to the Salt Lake City area following their conversion to the Mormon Church (Atkin 1958; Gregory 1948). In 1917, nearly all of the inhabitants returned to their native land, and the town site became a private ranching company's headquarters, first known as the Deseret Livestock Company and today as the Skull Valley Ranch Company. Skull Valley Road passes through the current ranch, and along the west boundary of the former town site.

The town site was formally recorded as an historic property in 1989 (Talbot 1989) under the site number 42TO540 and evaluated as being eligible for listing in the *National Register*. Three to five structures exist at the site which may date to the original town (two may have been constructed on earlier foundations in the 1930s). Each of these structures has been recorded separately in the Utah SHPO file system. The Iosepa Cemetery (Poulsea n.d.) was nominated and listed on the *National Register* in 1970. In 1987, the BLM completed an Environmental Assessment to allow the Iosepa

Historical Association a Recreation and Public Purposes Act lease that would allow public access and maintenance activities on the part of the cemetery that lies on public lands (BLM 1987).

Ranches and other sites. A number of historic ranches, active and abandoned, lie along Skull Valley Road. According to the 1871 GLO Map, at least four of these ranches were in place at that time. To date, none of these has been recorded as historic properties nor evaluated for *National Register* eligibility. One historic smelter site (42TO236) has been recorded in the northern part of Skull Valley.

3.6.3 Indian Trust Assets

Federally Recognized Indian Tribes are domestic dependent nations, and the Federal government acts as a trustee for those tribes. As a part of its guardian role, the Federal government is obligated to protect tribal interests, a duty that is referred to as the trust responsibility. This trust doctrine is defined through treaties, laws, executive orders, judicial decisions, and agreements.

Tribal trust resources are held by the Federal government in trust through treaties, statutes, judicial decisions, and executive orders. Such resources include money, land, natural resources either on or off Indian lands and other assets, retained by, or reserved by or for Indian tribes

The Department of the Interior Manual at 303 DM 2 (formerly Secretarial Order 3175) establishes the policies, responsibilities, and procedures for government-to-government consultation and legal obligations of the Federal government with Federally Recognized Indian Tribes and tribal members for the identification, conservation, and protection of American Indian and Alaska Native trust resources, trust assets, or tribal health and safety to ensure the fulfillment of the Federal Indian trust responsibility.

3.7 Background Radiological Characteristics

This section presents the background radiological characteristics of the proposed site. Background radiation is created by sources such as cosmic rays; radioactivity naturally present in soil, rocks, and the human body; and airborne radionuclides of natural origin (e.g., radon). Radioactivity still remaining in the environment as a result of the atmospheric testing of nuclear weapons also contributes to the background radiation level, although in very small amounts. Table 3.18 lists the average radiation dose to a member of the U.S. population from naturally occurring and artificial radiation sources. A discussion of radiation dose assessment terminology is presented in the dialogue box below.

A portion of the background radiological characteristics of the proposed PFSF site were determined from a survey of area gamma radiation levels (i.e., cosmic plus terrestrial components of Table 3.18) and samples of the surface soils (PFS/ER 2001). The area gamma measurements were obtained from thermoluminescent dosimeters (TLDs). Two of these dosimeters are located on the proposed PFSF meteorological tower and one is on the exterior of the Pony Express convenience store. The tower and the store are both located on Skull Valley Road, about 5 km (3 miles) southeast of the proposed PFSF site. During the period from December 1996, through January 2000, the average exposure rate measured by the dosimeters (cosmic and terrestrial components) was equivalent to 0.84 mSv/yr (84 mrem/yr) which is approximately 1.5 times the national average.

Table 3.18. Average annual effective dose equivalent of ionizing radiation to a member of the U.S. population

	Effective dose equivalent	
Source of radiation	**mSv (mrem)**	**Percent**
Natural		
Radon[a]	2 (200)	55
Cosmic	0.27 (27)	8
Terrestrial	0.28 (28)	8
Internal	0.39 (39)	11
Total natural[b]	***3 (300)***	***82***
Artificial		
Medical		
X-Ray Diagnosis	0.39 (39)	11
Nuclear Medicine	0.14 (14)	4
Consumer Products	0.1 (10)	3
Other		
Occupational	less than 0.01 (less than 1)	less than 0.03
Nuclear Fuel Cycle	less than 0.01 (less than 1)	less than 0.03
Fallout	less than 0.01 (less than 1)	less than 0.03
Miscellaneous[c]	less than 0.01 (less than 1)	less than 0.03
Total artificial[b]	***0.63 (63)***	***18***
Total natural and artificial[b]	***3.6 (360)***	***100***

[a]Dose equivalent to bronchi from radon daughter products.
[b]Totals have been rounded and may not be numerically identical to the sum of the dose values shown.
[c]From Department of Energy facilities, smelters, transportation, etc.

Source: NCRP 1987.

RADIATION DOSE ASSESSMENT TERMINOLOGY

Ionizing radiation: Electromagnetic waves or particles that are energetic enough to cause the production of ions upon interacting with matter.

Gamma radiation: High-energy, short wavelength electromagnetic radiation (packet of energy) emitted from the nucleus of an atom. Gamma rays are similar to X-rays but have a higher energy.

Maximally exposed individual (MEI): A hypothetical person who is assumed to be continuously present near (typically within 30 m) a transportation corridor for all spent nuclear fuel shipments or at the closest publicly accessible locations for a fixed site (such as the proposed PFSF storage area).

Curie (Ci): The basic unit used to describe the intensity of radioactivity in a sample of material. A curie is a quantity of any radionuclide that decays at a rate of 37 billion disintegrations per second.

Picocurie per gram (pCi/g): One trillionth part of a curie of a radioactive substance in a gram of matter. This unit is often used to express the quantity of radioactivity in water, soil, vegetation and animal tissue samples.

Rad: The rad is a unit of absorbed radiation dose in terms of energy. One rad is equal to an absorbed dose of 100 ergs/gram.

Rem: The unit of equivalent dose in humans. The dose equivalent in rem is equal to the absorbed dose in rad multiplied by the quality factor. The quality factor is the modifying factor used to derive dose equivalent from absorbed dose. This factor is necessary because differing radiation types can produce different biological effects even if they deposit the same amount of energy in a given tissue.

Person-rem: The sum of the individual doses received in a given period of time by a specified population from exposure to a specified source of radiation.

Person-sievert (person-Sv): A unit of collective dose equivalent to 100 person-rem.

Sievert (Sv): A unit dose equivalent to 100 rem.

Latent cancer fatality (LCF): A latent cancer fatality is a death from cancer resulting from, and occurring an appreciable time after, exposure to ionizing radiation. The probability of developing a fatal cancer from exposure to 1 rem of ionizing radiation is estimated to be 0.0005 (5 chances in 10,000). The coefficients or factors used for health effects in this FEIS for the public and occupational radiation risk are 5×10^{-4} and 4×10^{-4} health effects/rem, respectively. These coefficients are based on data obtained at much higher doses and dose rates than those encountered by the general public or workers. A linear extrapolation from the lowest doses at which effects are observable down to the occupational range was used to generate these coefficients. The assumption of a linear extrapolation has considerable uncertainty, but is believed to present a conservative estimate of the risk.

In a population of 10,000 people, national statistics indicate that about 2,224 people would die from cancer of one form or another. Using information developed by the International Commission on Radiological Protection, if all 10,000 people received a dose of 200 millirem (in addition to the normal background radiation dose), 1 additional cancer fatality would be estimated to occur in that population. However, we would not be able to tell which of the 2,225 fatal cancers was caused by radiation, and the additional radiation would possibly cause no fatal cancers.

Sometimes, calculations of the number of latent cancer fatalities associated with radiation exposure do not yield whole numbers, and may in fact yield numbers less than 1.0. For example, if each individual in a population of 100,000 received a total dose of 0.001 rem, the collective dose would be 100 person-rem and the corresponding estimated number of latent cancer fatalities would be 0.05 (that is 100,000 persons × 0.001 rem × 0.0005 latent cancer fatality per person-rem). Because this numerical result is less than 1 fatality, further interpretation (as discussed below) is required. The result must be interpreted as a statistical estimate. That is, 0.05 is the *average* number of death that would result if the same exposure situation were applied to many different groups of 100,000 people. For most groups, no single individual would incur a latent cancer fatality from the 0.001 rem dose each person would have received. In a small fraction of the groups, 1 latent fatal cancer would result; in exceptionally few groups, 2 or more latent fatal cancers would occur. The *average* number of deaths over all of the groups would be 0.05 latent fatal cancer (just as the average of 0, 0, 0, and 1 is 1/4 or 0.25). For the scenario under discussion, the most likely outcome for any single group of exposed persons is 0 latent cancer fatalities.

PFS collected five soil samples from the surface of the proposed site in November 1996. The approximate locations of the samples were at the center and at each of the four corners of the site. The radiological analysis consisted of gross alpha/beta spectrometry for radionuclide concentrations. Detectable alpha radiation ranged from 8.6 to 11 pCi/g, and the beta from 22 to 37 pCi/g. A gamma spectrometry analysis was also conducted on the soil samples. The range of results, above detectable limits, included the radionuclides shown in Table 3.19. With the exception of cesium-137 (which originates from atmospheric nuclear tests), the radionuclides in Table 3.19 are all parts of the decay chain of naturally occurring uranium. These concentrations are in general agreement with similar surveys performed for the nearby Envirocare of Utah site at Clive, Utah, about 40 km (24 miles) northwest of the proposed PFSF site (NRC 1993) (see Figure 1.1).

Table 3.19. Radionuclides found in five soil samples from the proposed PFSF site

Radionuclide	Range of activity (in pCi/g)
Potassium-40	10 to 16
Cesium-137	0.07 to 6.1
Lead-210	0.58 to 1.1
Bismuth-212	0.97 to 1.3
Lead-212	0.50 to 0.85
Bismuth-214	0.92 to 1.4
Lead-214	0.76 to 1.1
Radium-223	0.24 to 0.52
Radium-224	3.0 to 9.6
Radium-226	1.3 to 2.3
Actinium-228	0.75 to 1.2
Protactinium-231	2.2 to 3.1
Uranium-235	0.08 to 0.14
Uranium-238	0.57 to 1.4

Source: PFS/ER 2001.
Note: Only radionuclides with activities above detectable limits have been included.

There are no perennial surface waters within 8 km (5 miles) of the proposed PFSF site, and, consequently, no water samples were taken for radiological analysis. Although no radiological samples of the vegetation were obtained, an indication of the radiation levels in area vegetation and in the flesh of mammals (i.e., rabbits) was reviewed as part of the environmental study for the Envirocare facility (NRC 1993) and is summarized in Table 3.20.

Although PFS considers the background radioactivity levels in vegetation and mammal flesh in the vicinity of the Envirocare facility to be representative of the background radioactivity levels near the proposed PFSF site and along the proposed Skunk Ridge rail corridor, PFS has stated that it will establish a preoperational radiological environmental baseline. The baseline will include sampling for radioactivity in soil, groundwater, vegetation, and the flesh of non-migratory mammals near the proposed PFSF site.

Table 3.20. Radionuclides found in vegetation and rabbit flesh as part of the Envirocare environmental study

Radionuclide	Activity in vegetation (average, pCi/kg)	Activity in rabbit flesh (average, pCi/kg)
Lead	198.0	4.0
Polonium-210	48.0	8.0
Radium-226	3.1	0.6
Thorium-230	6.0	0.5
Uranium	5.4	0.5

Note: Activities are shown on a "wet weight" basis.

Source: U.S. Nuclear Regulatory Commission, 1993, *Final Environmental Impact Statement to Construct and Operate a Facility to Receive, Store, and Dispose of 11e.(2) Byproduct Material Near Clive, Utah*. Docket No. 40-8989, NUREG-1476. Washington, D.C.

3.8 Other Environmental Features

3.8.1 Ambient Noise Levels

Background noise levels in Skull Valley are low. Where natural sounds, such as those from flying insects and wind become dominant, daytime sound levels can drop to 30 dB(A) and lower. This is quieter than many locations that are considered "remote." However, the relative quiet of Skull Valley is interrupted by routine military flight operations. Existing vehicle traffic increases noise levels near Skull Valley Road, especially in areas where people congregate. Daytime background levels of 48 to 50 dB(A) have been measured about 18 m (60 ft) from Skull Valley Road near the Pony Express Convenience Store. For comparison, EPA (1974) has provided guideline sound levels below which the general public would be protected from activity interference and annoyance; 55 dB(A) applies to outdoor locations "in which quiet is a basis for use" and 45 dB(A) applies to indoor residential areas.

3.8.2 Scenic Qualities

The proposed PFSF would be located approximately in the center of the southern third of Skull Valley. This portion of the valley is largely undeveloped and features numerous scenic qualities, including clear views of the Stansbury Mountains to the east (see Figure 3.10) and distant views of the Cedar Mountains to the west (see Figure 3.11). The Stansbury Mountains rise to heights of over 2,743 m (9,000 ft) in several places, with Deseret Peak being over 3,352 m (11,000 ft). Some ridges in the Cedar Mountains are at elevations of over 2,134 m (7,000 ft). These two mountain ranges define Skull Valley and provide its most important scenic qualities.

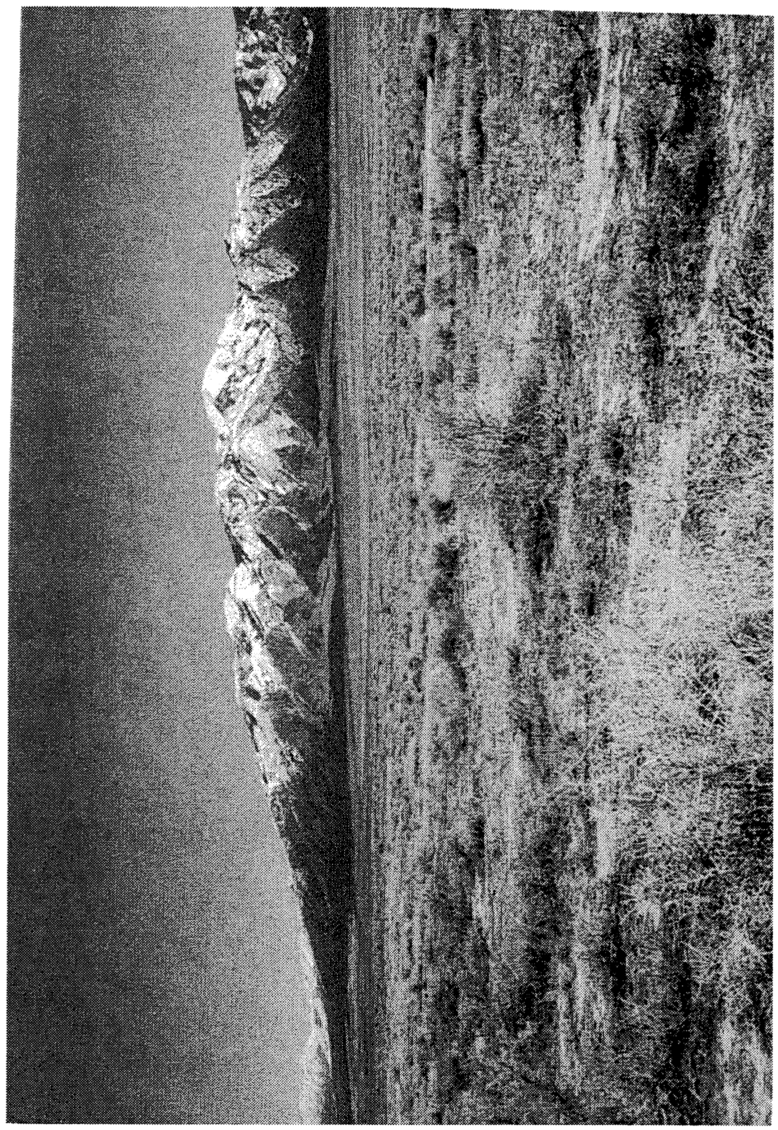


Figure 3.10. View from the proposed PFSF site looking east toward the Stansbury Mountains.

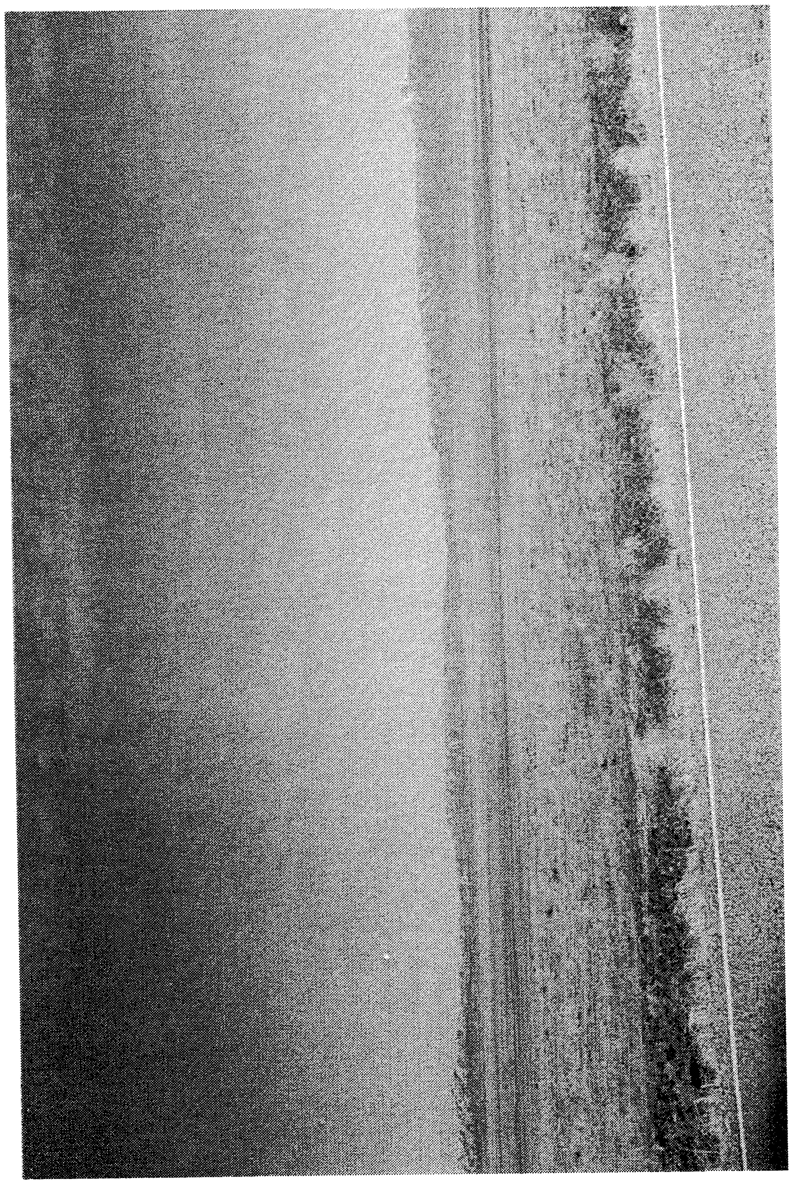


Figure 3.11. View from looking west toward the Cedar Mountains.

The proposed site also offers expansive views across the floor of Skull Valley between the mountain ranges. The landscape in the vicinity of the proposed site is dry rangeland interspersed with some irrigated fields. Several ranch residences and ranch-related buildings with small numbers of cattle are scattered throughout the valley, but the predominant landscape characteristic is the vast expanse of undeveloped and uncultivated land.

The most noticeable manmade feature in the valley is Skull Valley Road, which is located just west of the Stansbury Mountains and about 20 km (12 miles) east of the Cedar Mountains. A single overhead power distribution line on wooden poles parallels Skull Valley Road from Interstate 80 south to Dugway.

Skull Valley is most often viewed by local residents and motorists on Skull Valley Road. There are approximately 150 residents of the valley, and Average Daily Traffic (ADT) on Skull Valley Road in 1997 was 325 vehicles south of the town of Iosepa (PFS/ER 2001) (see Table 3.15). In terms of visual exposures to the proposed site, this ADT represents almost 120,000 annual vehicle trips multiplied by the average number of passengers per vehicle. Most of the ADT on the road is comprised of trips made by the relatively few individuals who reside or work in Skull Valley or Dugway.

Skull Valley is also viewed by hikers, hunters, campers, and other visitors in the Wasatch-Cache National Forest and the Deseret Peak Wilderness area to the east, and in the Cedar Mountains Wilderness Study area to the west. In 1997, for example, there were 9,600 visitor days classified as hiking, hunting, and camping in the Deseret Peak Wilderness (J. Van Dyke, Oak Ridge National Laboratory, Oak Ridge, Tenn., personal communication with Jack Vanderberg, Acting Recreation Manager, Salt Lake Ranger District, Wasatch-Cache National Forest, January 27, 1999). Although data on the exact locations of recreational visits are not available, at least some visitors view Skull Valley from the Wasatch-Cache National Forest, the Deseret Peak Wilderness area, and the Cedar Mountains Wilderness Study area (see Section 3.8.3).

3.8.3 Recreation

BLM land in Skull Valley provides opportunities for recreation, including off-highway vehicle (OHV) use, dispersed camping, and hunting. Under its OHV designation, the BLM land near the proposed PFSF is open to all types of motor vehicle use (BLM 1992b). However, there are no designated camping areas or OHV trails or roads within a 8 km (5 mile) radius of the proposed PFSF (PFS/ER 2001). Horseshoe Springs, 24 km (15 miles) north on Skull Valley Road, is the closest developed recreation facility on BLM land (see Figure 1.2). BLM reports visitor use of this area at 500 to 1,000 visits per year (PFS/ER 2001), although there is a considerably greater recreational use of BLM land in areas just outside Skull Valley.

In addition to BLM land, recreational visitors use other resources in the vicinity of the proposed project, including Mount Deseret [approximately 15 km (9 miles) northeast of the proposed PFSF] in the 10,120 ha (25,000 acre) Deseret Peak Wilderness located within the Stansbury Mountain unit of the Wasatch-Cache National Forest. The U.S. Forest Service manages the area for primitive recreational use at dispersed locations; developed recreational facilities and motorized vehicles are prohibited in wilderness areas. Recreational activity includes hiking, hunting, and horseback riding. The number of annual recreational visits to the Deseret Peak Wilderness is estimated at 18,000 (PFS/RAI1 1999). In addition to the Deseret Peak Wilderness, the Forest Service provides recreational opportunities in the Wasatch-Cache National Forest, including camping and hiking. The Forest Service estimates 17,000 visits annually within the six campgrounds maintained by the Forest Service in the Wasatch-Cache National Forest and 9,500 visits per year to two trail heads maintained within the Wasatch-Cache National Forest. Besides the view of the landscape, the Skull Valley Road provides significant opportunities to view raptors.

Wilderness. The BLM also administers the 20,445 ha (50,500 acres) Cedar Mountains Wilderness Study Area (WSA), which provides opportunities for solitude, primitive and unconfined recreation, including the opportunity to view wild horses, deer and upland game hunting, hiking, backpacking, and horseback riding and packing (BLM, Utah Wilderness Inventory 1999, accessed from the internet at http://www.ut.blm.gov/wilderness/wrpt/wrptcontents.html).

In addition, the BLM has recently re-inventoried some lands within Utah, including areas near the Cedar Mountains WSA for their wilderness characteristics. This re-inventory identified six units (i.e., parcels of land or sections) adjacent to the Cedar Mountains WSA, with a total of 6,290 ha (15,540 acres), having wilderness characteristics (BLM, Utah Wilderness Inventory 1999, accessed from the internet at http://www.ut.blm.gov/wilderness/wrpt/wrptcontents.html). Of these six units, Units 1, 2, and 3 are on the northern, northeastern, and eastern portions of the Cedar Mountains WSA, respectively, and are closest to the route of the proposed rail line from Skunk Ridge to the proposed plant site (see Figure 3.12).

The six units enhance the opportunities for solitude and primitive recreation found within the adjacent Cedar Mountains WSA. In addition, Unit 1 has supplemental values related to a historic trail. Hastings Cutoff through Hastings Pass at the northern end of Unit 1 was once the path taken by travelers using the historic California Trail. The Hastings Cutoff segment of the California Trail was the route taken by the Donner Party on their fateful journey to California. The California Trail is a designated National Historic Trail (BLM, Utah Wilderness Inventory 1999, accessed from the internet at http://www.ut.blm.gov/wilderness/wrpt/wrptcontents.html).

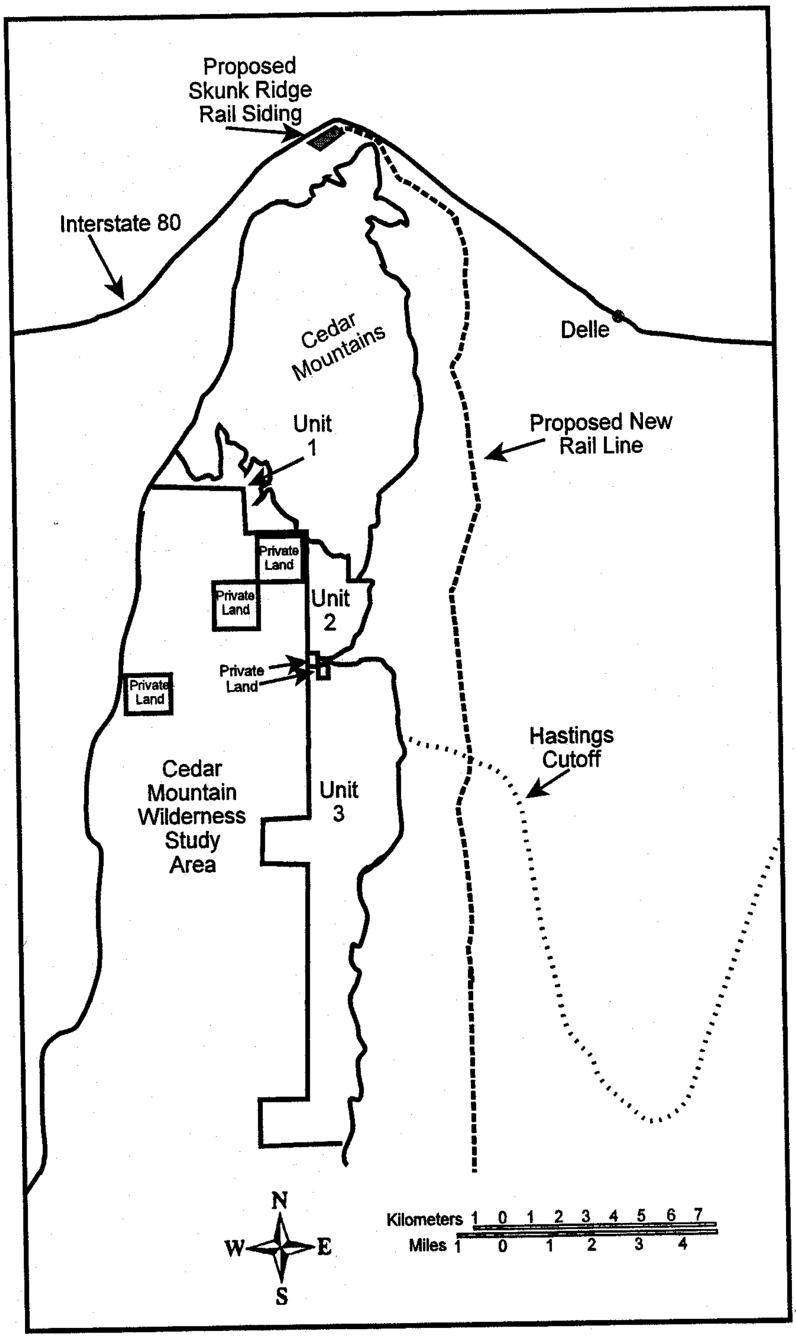


Figure 3.12. Wilderness study areas and unit areas recently inventoried for their wilderness characteristics.